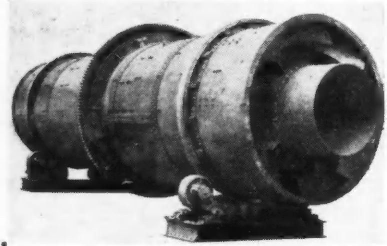
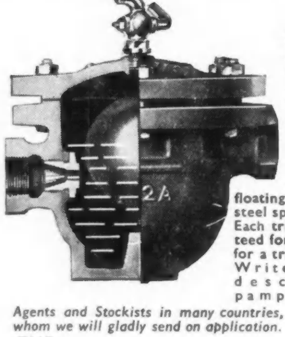
LABORATORY FURNISHING AND SCIENTIFIC INSTRUMENT NUMBER.

CHEMICAL AGE

V LVIII 24 APRIL 1948 No 1502

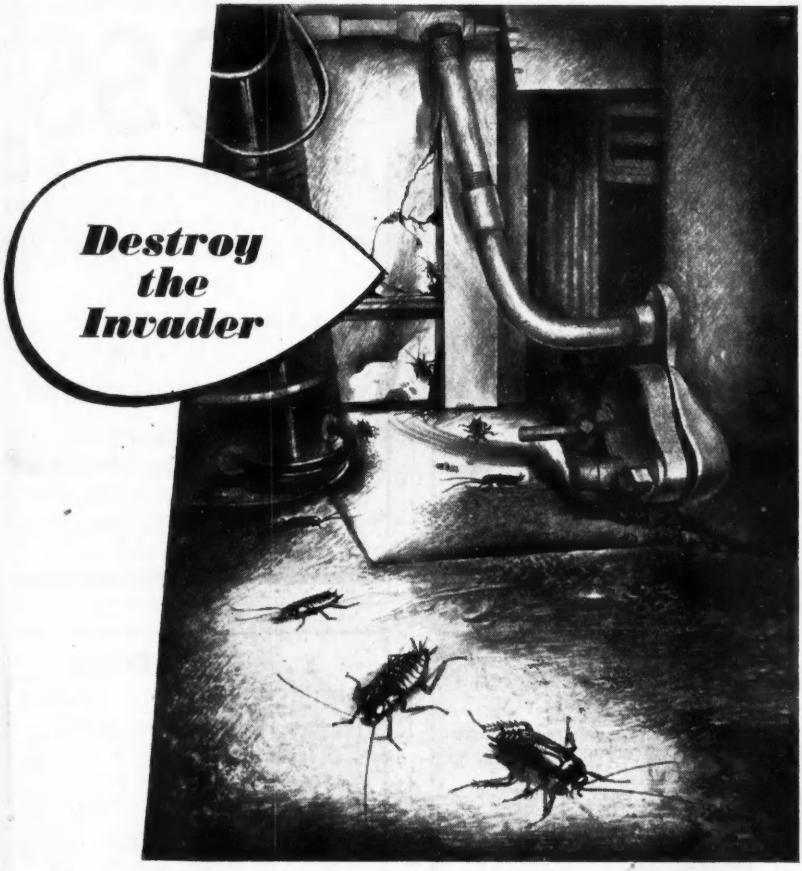




INDEX TO ADVERTISERS

IN THIS ISSUE

	Page
Advance Components, Ltd.	xxvii
Allen, Edgar & Co., Ltd.	Cover ii
Automatic Coil Winder & Electrical Equipment Co. Ltd., The	xxxv
Avimo, Ltd.	vi
Baird & Tatlock (London) Ltd.	xxiii
Balfour, Henry & Co., Ltd.	xi
Bellingham & Stanley, Ltd.	viii
Black, B. & Sons, Ltd.	vi
Blackwell's Metallurgical Works, Ltd.	lvi
Bowman's Chemicals, Ltd.	lvi
Bristol's Instrument Co., Ltd.	xxxvi
British Drug Houses, Ltd., The	iv
British Tar Products, Ltd.	xlviii
Brough, E. A. & Co., Ltd.	xlvi
Central Office of Information	lv
Chance Brothers, Ltd.	xxix
Classified Advertisements	l, li, lii, liii & liv
Cooke, Troughton & Simms, Ltd.	xlix
Cruickshank, R., Ltd.	Cover ii
Cyclops Engineering Co., Ltd., The	xlii
Cygnet Joinery, Ltd.	xxxii
Doulton & Co., Ltd.	xiv
Dryden, T.	viii
E.C.D. Ltd.	xlii
Evans Adlard & Co., Ltd.	xiv
Evered & Co., Ltd.	xxxix
Evershed & Vignoles, Ltd.	xxi
Feltham, Walter H. & Son, Ltd.	lvi
Foxboro-Yoxall, Ltd.	ii
Gallenkamp, A. & Co., Ltd.	xix
Genatosan Ltd.	xxxviii
General Chemical & Pharmaceutical Co., Ltd., The	xxx
Greening, N. & Sons, Ltd.	xxx
Griffin & Tatlock, Ltd.	xvii
Hannan & Buchanan	viii
Hardy, M. W. & Co., Ltd.	x
Harris, Francis W. & Co., Ltd.	xlvi
Haughton's Metallic Co., Ltd.	lvi
Hearson, Charles & Co., Ltd.	xiii
Hunter Machine Co., Ltd., The	601
Imperial Chemical Industries, Ltd.	vii
Jobling, James A. & Co., Ltd.	xvi & xxvi
Johnson, Matthey & Co., Ltd.	xxxi
Jones Gas Process Co., Ltd.	x
Kent, James Ltd.	Cover iii
Kernick & Son, Ltd.	xxviii
Kestner Evaporator & Engineering Co., Ltd., The	iv & liv
Key Engineering Co., Ltd., The	Cover ii
Laboratory Suppliers, Ltd.	xviii
Leeds & Bradford Boiler Co., Ltd.	liv
Leigh & Sons, Metal Works	lvi
Leitz, E. (London), Ltd.	xxiv & xxv
Lennox Foundry Co.	lvi
McCulloch Bros. & Wilson, Ltd.	xxviii
Metropolitan-Vickers Electrical Co., Ltd.	Cover iv
Mirrlees (Engineers), Ltd.	xx
Muirhead & Co., Ltd.	597
Mullard Wireless Service Co., Ltd., The	xxvi
National Enamels, Ltd.	xxx
Negretti & Zambra, Ltd.	ix
Newton Chambers & Co., Ltd.	xv
Nicolson, W. B. (Scientific Instruments), Ltd.	xxxii
Norman Engineering Co., Ltd.	i
Nottingham Thermometer Co., Ltd., The	xviii
Oertling, L., Ltd.	Front Cover
Oliver Pell Control, Ltd.	Cover iii
Organic Dyestuffs, Ltd.	xliv
Orr, Geo. W. & Co., Ltd.	liv
Pascall Engineering Co., Ltd., The	xlv
Perry & Hope, Ltd.	602
Potter, F. W. & Soar, Ltd.	xviii
Quickfit & Quartz, Ltd.	xliv
Reeve Angel, H. & Co., Ltd.	xxii
Rowlandson & Co.	xl
Short & Mason, Ltd.	xlvii
Silica-Gel, Ltd.	Cover iii
Simon, Richard & Sons, Ltd.	xxxviii
Smoker, G. H.	ix
Somerville & Morrison, Ltd.	lvi
Spence, Peter & Sons, Ltd.	xxxvi
Stanton Instruments, Ltd.	v
Steiner, L. A.	xvi
Sugden-Powell, Ltd.	xl
Swift & Co., Pty., Ltd.	xxviii
T. & T. Works, Ltd.	l v
Tate, James & Co.	xxxiv
Thermal Syndicate, Ltd., The	xli
Thermo-Plastics, Ltd.	i
Towers, J. W. & Co., Ltd.	xliii
Townson & Mercer, Ltd.	599
Tretol, Ltd.	liv
Ultra Lens Co., The	xxviii
Unifloc Reagents, Ltd.	xlviii
Voss Instruments, Ltd.	viii
Walker, James & Co., Ltd.	Cover iv
Walker, Crossweller & Co., Ltd.	xliv
Watford Chemical Co., Ltd.	xxxiv
Webb, William A., Ltd.	xxxiii
Wild-Barfield Electric Furnaces, Ltd.	xxxvii
Wilkinson, James & Son, Ltd.	xx
Winkworth-Machinery	xxii
Wolters Balances, Ltd.	xii
Worcester Royal Porcelain Co., Ltd., The	xii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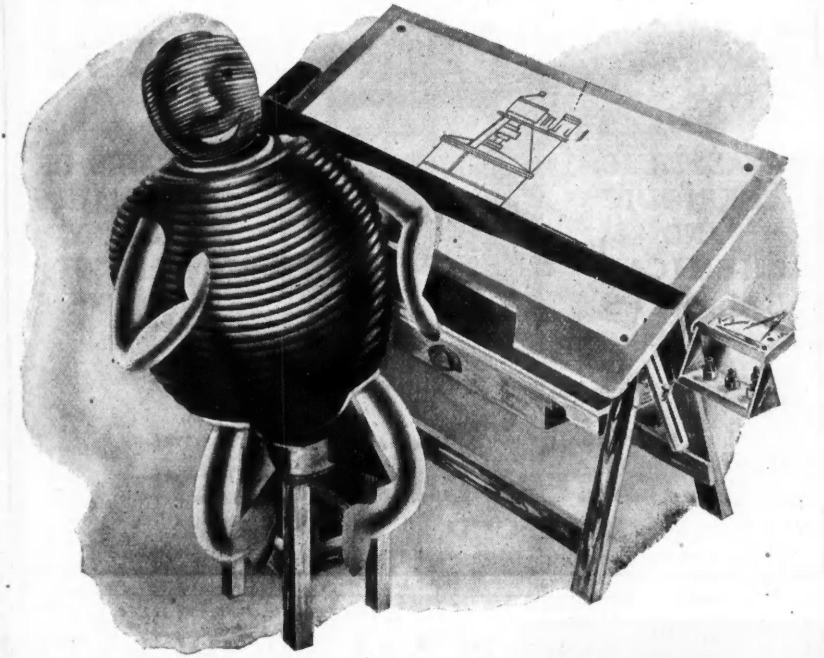

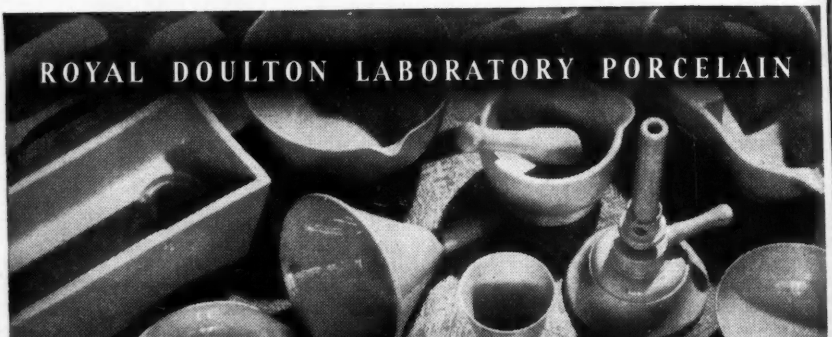
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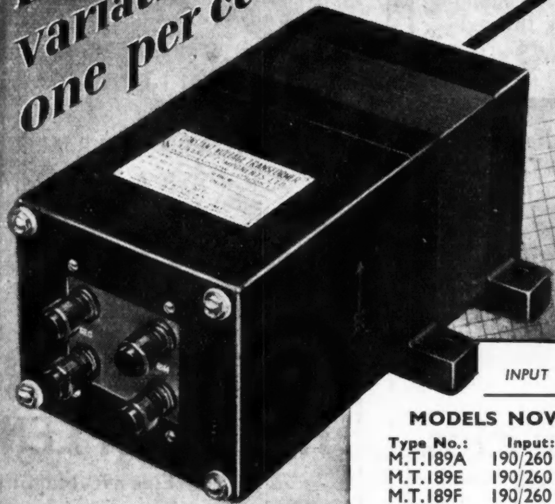

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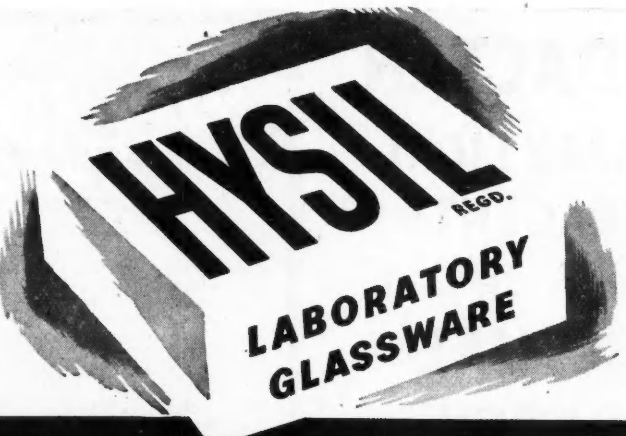

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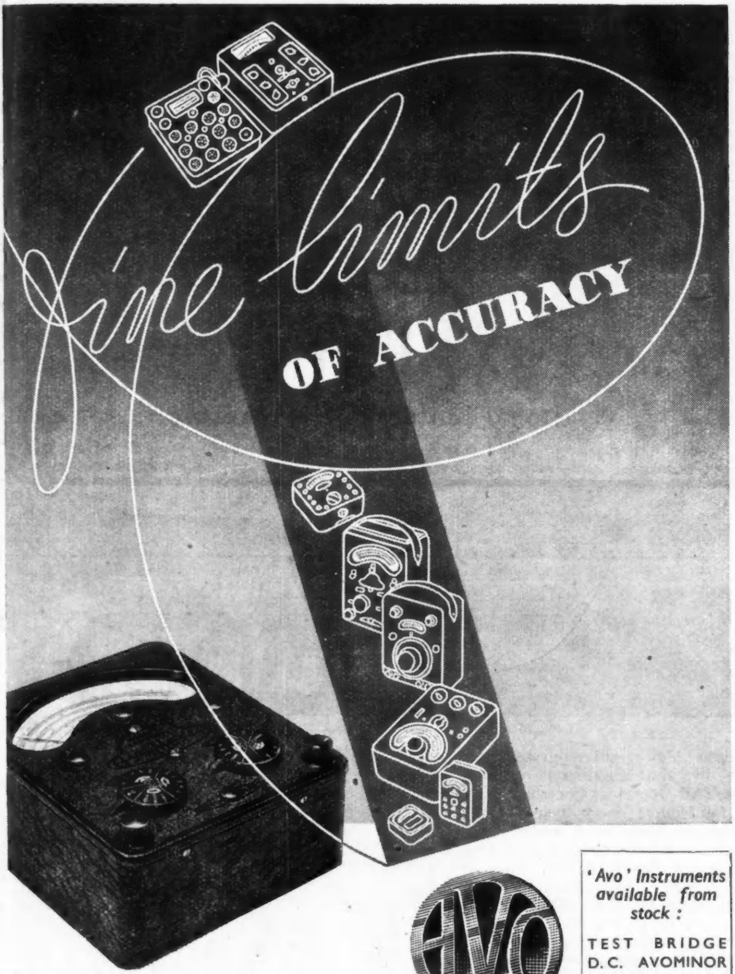
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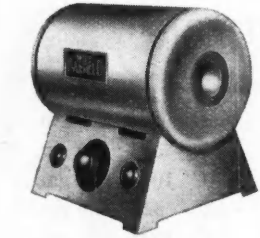

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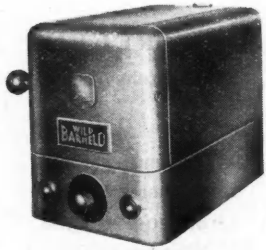

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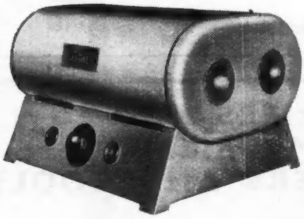

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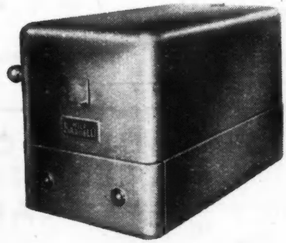

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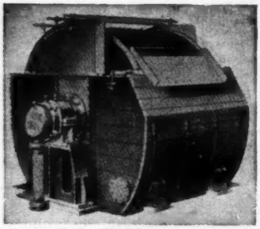

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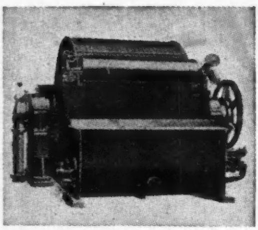

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The Instruments of Chemistry

HERMAN BOERHAAVE, writing in 1732 in his *Elementa Chemiae*, defines " instruments " as " certain bodies by whose means the requisite actions are produced." " These," he says, " we usually reduce to six principal ones : fire, water, air, earth, menstruums, and utensils." Fire, water, air (or oxygen), and bodies derived from earth, are still and always will be, essentially for the operations of chemistry. Water, the universal solvent, and oxygen (and in some reactions nitrogen too) still play much the same part that they always did, a part that has become increasingly considerable as more chemical reactions have been discovered, but is still fundamentally what it was.

Our knowledge of bodies derived from " earth " has been extended immensely during the intervening two centuries. It is quite certain that this accretion of knowledge has been made possible largely through greater precision in measurement, the use of new and highly refined methods of making physical determinations, and the resulting use of mathematics, which Boerhaave and his contemporaries had not recognised as an instrument of chemistry. Mathematics, of course, cannot be applied until we have something on which to apply it, and that involves precise measurement.

Fire in the form of heat is now even more important than it was in Boerhaave's day because fuel technology has become a branch of industrial science that has its own Chartered Institute and is by way of becoming a science in its own right, although in truth it is fundamentally a branch of chemistry. The " menstruums," which Boerhaave acknowledged to be " a barbarous term," derived from the alchemists' practice of heating their mixtures for a philosophical month of 40 days, now find no place in the conceptions of chemistry. It was formerly defined as a body " which, when artificially applied to another, divides it subtily," or, in a phrase, it was the cause of chemical reactions. Here, again, our increased knowledge of the mechanism of chemical change has been derived from measurement of many different sorts, combined with mathematical treatment of the data so obtained. This change has been due, in fact, to the impact of physics on chemistry.

This brings us to a consideration of " utensils." Boerhaave's first volume ends with an illustrated description of the chemical apparatus of his day. Distillation units form the most prominent part of the equipment. A melting furnace is seen in his illustration in which material is being fused. A water-bath is also seen in use for distillation. There is a unit for subliming flowers of sulphur and there was in use a curious instrument known as " a bell to make eager the spirit of sulphur." Prof. Read (" Humour and Humanism," p. 157), describing the laboratory of 1732, says : " The ventilation of these eighteenth-century laboratories seems to have depended upon the opening of doors and windows. The absence of tables or benches also seems strange to the modern chemist, but beakers, test-tubes, and other small pieces of apparatus requiring such fittings found no

On Other Pages

Leader:
The Instruments of Chemistry ... 543
Notes and Comments:
Essential Industry 545
Brains and Skill 545
Production Pitfalls 545
Two Views 546
Competing Interests 546
Atomic Research 547
Arc Acetylene 548
Regaining the Initiative 549
Monsanto Claims $50 m. Damages ... 550
The Need for Resource 551
Team Work in Engineering 553
Increased Collaboration Urged ... 554
Ciba's Mounting Profits 555
SCIENTIFIC INSTRUMENTS SECTION
U.S. Gas Synthesis Project 556
The New Electron Microscope ... 558
X-ray Diffraction in Routine Production Control 561
British Instrument Makers' Campaign 563
Laboratory Supplies in 1948 566
U.S. Leak Detector 568
Rapid Electric Heating 569
Photo-Electric Absorptiometer ... 571
Electric Heating Devices 573
New Scientific Equipment 574
Moisture Content Measurement ... 577
High Vacuum Installations 578
New Control Instruments 579
Small Laboratory Tools 580
Laboratory Construction and Layout 581
Oil Refining in Germany 587

place in the large-scale preparative work which formed the chief activity of the chemists of that age."

This reconstruction of the early days, when the "chemical revolution" that slightly preceded and accompanied the "industrial revolution" was only just beginning, serves to illustrate certain important deductions on which everyone is now agreed. The chemist of 200 years ago was occupied to a large extent with manufacturing his own chemicals and using them to conduct experiments on a large scale. It was only when the test-tube and balance, in short laboratory-scale apparatus, came into use that real progress was achieved. Broad generalisations were thus made possible which were to lead to modern chemistry. It was possible in those days and for very many decades thereafter to make real headway with simple apparatus aided by that indispensable equipment represented by the capacity for clear thinking and clever deduction.

As years passed and physics joined hands with chemistry, the need for more and more precise measurement became evident. Through such measurements many discoveries were made, for example, the rare gases of the atmosphere, the composition of the sun, isotopes, and the constitution of the atom with all its consequent developments. Without instruments of continually increasing precision and delicacy it would have been impossible to make most of the discoveries of modern science; great industries that are now commonplace could never have arisen; the world would be a very different place.

Honour is rightly paid to past and present giants of science to whose work far-reaching discoveries have been due. It has often seemed to us that insufficient honour has been paid to those who have specialised in the manufacture of the instruments that made that work possible. New instruments are often devised by the scientist who has felt the need of them. But there is a wide gap between devising an instrument in the laboratory for the personal use of the expert who has designed it, and the production of a finished model capable of being sold at a reasonable price and thus made available for hundreds of other workers. The electron microscope may be cited as a case in point, but the spectroscope, the oscillograph, X-ray apparatus, and other optical appliances, the new electronic apparatus, and the whole range of electric appliances are even better illustrations because they are in more general use.

Whether we are thinking of the chemist or physicist making his fundamental measurement, or of the industrial laboratory worker keeping his analytical watch on the operations of his works, or of the chemical engineer who needs to control his plant automatically and to register its operations, the instrument-maker must be admitted as an indispensable factor in the progress of modern industry and science.

NOTES AND COMMENTS

Essential Industry

THE manufacture of scientific instruments and appliances—some recent progress in which is discussed and illustrated in this Laboratory Furnishing and Scientific Instruments Number of THE CHEMICAL AGE—has reached a fateful stage in its development when either great advances, conferring scientific and economic benefits on a most liberal scale, or an equivalent degree of stultification are possible. Our rejection of the latter possibility is fully supported by the very ample evidence we have had during and since the war of the courage and vision which British investigators in this field have displayed. The fact that the possibility exists must be attributed almost entirely to the meagre degree of recognition given by various authorities of the need to permit instrument and equipment makers to enjoy certain essentials. Those are, briefly, fuller supplies of relatively few basic materials, more skilled workers, and the opportunity of competing on an equal basis with comparable industries on the Continent. Judged by their eligibility for export, British scientific instruments are capable of bringing a rich return, while making the smallest demand on imported material; as essential tools for the creation of other forms of exports their claim for a fuller share of national resources is equally unassailable. It is certainly not a coincidence that the most highly industrialised nation in the world employs instrumental controls in all branches of manufacturing industry on a scale which we still are prone to regard as prodigal.

Brains and Skill

"WHEN we export scientific instruments we export brains," says the president of SIMA (page 563) to which we constrained to add: " and the fruits of a very high order of skill and craftsmanship," which, like the other priceless commodity, cannot be provided or withheld by Government initiative. This is how one of the principal manufacturers has expressed the problem to us: " The cause of much of the difficulty in reviving instrument supplies is associated with those items in which craftsmanship principally is the controlling factor. All the makers have been taking vigorous steps to increase production wherever possible by ordinary workmanship methods, but where production hinges on a really skilled operation periods of seven to ten years are required to get the necessary skill. The plundering of the workshops by the Forces during the war is now showing up in its true perspective; but for this there would by now have been a satisfactory number of trained operators who had had several years at the work. As it is, in certain of the crafts, a further two to three years will be required before operators with sufficient skill will be available in large enough numbers to catch up with outstanding orders." That represents a problem which no " direction " order yet framed is in the least likely to relieve. It must be solved by the industry itself, with the best aid the Government can provide—a free hand to recruit and to train.

Production Pitfalls

SEVERAL reasons besides the official ones have been suggested as having influenced the recent lowering of export aims for chemicals and a lot of other key materials. While shortage of raw materials and, in some departments, of labour is manifestly a serious factor, there is much to support the widely held view that better distribution could have prevented some of the lamentable results that have lately been seen, and could perhaps have altered the entire export picture. What other view can be taken of some recent occurrences in the field with which THE CHEMICAL AGE is concerned? There have been, for example, the news from Athole G. Allen (Stockton), Ltd., that production of several fundamentally necessary chemicals was being discontinued because of the unavailability of witherite under official control; the revelation last week of how a very promising project in the glass industry has been partially paralysed by lack of soda ash. Material supplies and equipment present problems that cannot be belittled or dismissed and lately there has been a third obstacle—the withholding of building licences—preventing expansion when the other two impediments have been overcome. A deplorable instance of this has just come to light in connection with the

British Aluminium Company's attempt to expand on a large scale its production of aluminium thin strip at its Falkirk works. There, the first obstacle, of obtaining the substantial new plant, has been overcome (it was ordered, says the BAC chairman, in 1946). Now, it seems, this expensive equipment may have to stand idle for want of a building licence to put a roof over it. In some countries the perpetuation of pitfalls of that kind would be described as sabotage.

Two Views

THE considered views of principal figures of two of the organisations of chemical industry, appearing elsewhere in this issue, provide a rather unusual contrast in attitudes towards the Government's increasingly close collaboration in the chemical and other industries. "Collaboration," in this context, represents the view taken by Mr. A. G. Grant, chairman of the British Chemical Plant Manufacturers' Association, of what Mr. H. W. Cremer, president of the Institution of Chemical Engineers, would be prone to condemn as inept interference. Chemical industry is fortunately large and varied enough to find room for all kinds of views, not excluding even Mr. Grant's plea for a more cheerful acceptance of whatever the Government planners have in store for us. It embraces at the same time an even larger body of individuals to whom such a policy is anathema, and whose conversion will be hard to bring about so long as Government influence in chemical affairs frustrates much more than it facilitates. The FBI chairman, whose views on that subject also are represented in this issue, is very manifestly not in the camp of the collaborationists.

Competing Interests

DURING 1948 North American chemical industries, in which we include oil, paper and fertilisers, will receive a "financial blood-transfusion" to promote new growth alone involving the dollar equivalent of £15.5 million. That represents only the price of new construction in the U.S.A. and Canada (£2.9 million) for which contracts have already been awarded, as listed by the U.S. *Chemical Engineering*, and is, of course, not necessarily the true grand total. Vast as the total is, the estimated expenditure on construction work projected this year but not yet contracted dwarfs it by comparison. For that the equivalent of £44.6 million is being set aside. Supposing that this impressive total is compared with whatever corresponding amount shortage of material and labour and capital restriction now permits to our own chemical industry any forecast of the relative importance in the next few years of the British and American industries involves the inescapable conclusion that transatlantic competition must become an increasingly formidable factor. For the moment this threat is a bomb of the "DA" sort because of the virtually universal scarcity of chemicals and of dollars. In the absence of any economic equivalent of the bomb disposal squad, however, ordinary prudence seems to suggest that evacuation of some of the most vulnerable positions and concentration of force at our strong points, not omitting dyestuffs, sodium chemicals and medicinals, should figure in current and future policy of chemical industry just now. Directors of policy are, of course, well aware of this. Whether the master planners in Government departments, who still so largely direct the directors, foresee the need to promote an industrial economy which will complement rather than compete with the U.S. is less certain.

Petrol Cut Warning

CONCERN is expressed by the British Road Federation at the proposed reduction by 10 per cent in the fuel allocation for commercial vehicles, and the fact that private motorists who receive supplementary allowances for commercial purposes will not benefit from the new concession of all-purpose petrol. The federation, noting that it is inevitable that the task of distribution of supplies essential to the national life will be more complicated and difficulty will be experienced in the summer months due to the general dispersal of the holiday population, says it will watch with considerable anxiety the problems arising which are bound to affect the large number of industries represented.

Atomic Research

Harwell Building Delays Explained

THE construction of the atomic energy research establishment at Harwell is described in a combined statement by the Ministries of Supply and Works as one of the most complex building projects ever undertaken in this country, involving the design and erection of a number of buildings and plants of types previously unknown. The statement takes the form of a reply to comments, made last year by the Select Committee on Estimates, relating to prolonged construction delays.

Steel Priorities

Since February, 1947, when Prof. Cockroft said that a six-month delay had occurred in the tentative timetable, atomic energy had become a priority for iron and steel. Although this had resulted in improved deliveries of structural and similar steel, the statement continues, manufactured supplies were still difficult to obtain. Another problem was the labour force—at the present time more than 3000 men are employed—which could not be augmented without detriment to other essential building in the area.

No Organisation Faults

The Ministries say they do not accept the implication in the committee's report that the delays are due to faults in organisation. There had been other delays due to inevitable design changes and new requirements which had become apparent only when the work was well under way. It had also been necessary to provide accommodation for scientists over and above the original estimates.

Inquiry Rejected

Operation of the low-powered pile is now an established fact, conclude the Ministries, and the larger pile should be ready by the middle of this year. Rejecting the committee's suggestion for an independent inquiry into the organisation of the work, the statement draws a comparison between the U.K. project and that of the Chalk River establishment in Canada, and observes that building times compare favourably.

4·4 m. Tons of U.S. Sulphur

In December last U.S. output of native sulphur—389,014 tons—was less than 1 per cent below the October record. Production, mine shipments, and apparent sales for the year were 15, 17 and 18 per cent greater, respectively, than in 1946. Stocks decreased by 398,334 long tons during 1947, but production totalled 4.441 million tons.

New Export Targets

Revised Figures for Chemicals

ALTHOUGH there is to be a general reduction in the Government's export targets for chemicals and dyestuffs this year (THE CHEMICAL AGE, April 17) shipments of certain other items of plant and materials utilised in the chemical industry are to be maintained at the present level and—in one or two instances—will be increased. The following are the revised export figures in respect of individual products :—

Product	Monthly Rates September target	Monthly Rates New target
	£ million at end=1948 values	
Raw materials		
Coal	3.90	3.90
China clay	3.45	0.15
Other raw materials ...	3.45	1.95
Non-ferrous metals		
Aluminium hollow ware ...	0.21	0.21
Implements and instruments		
Medical and surgical instruments		0.23
Opthalmic instruments ...	0.66	0.04
Other scientific instruments ...		0.60
Sensitised photographic materials	0.32	0.32
Machinery		
Shell boilers	0.12	0.12
Boiler-house plant accessories...	1.00	0.56
Condensors	0.04	0.04
Furnace plant	0.08	0.12
Gas and chemical plant ...	0.14	0.14
Chemicals, drugs, dyes, etc.		
Chemicals, dyes, dyestuffs, paints, distempers, etc. ...	6.95	5.90
Proprietary medicines	0.60	0.70
Other drugs and medicines ...	1.45	1.45
Oils, fats and resins		
Fuel oils, petroleum, paraffin wax, etc.	0.80	0.80
Other oils, soap, etc.	0.25	0.45
Pottery, glass, abrasives, etc.		
Ceramics and refractories ...	0.23	0.23
Plate and sheet glass ...	0.44	0.44
Scientific glassware	0.10	0.10
Glass bottles	0.06	0.06
Miscellaneous manufactures		
Gelatine and glue	0.05	0.05
Plastic materials	0.37	0.37
Polishes	0.42	0.22

Metallurgists at Murex Works

Twenty-one members of the Institute of Metals recently visited the Rainham works of Murex, Ltd., and inspected the various departments, including the vanadium and ferro molybdenum plants and the processing sections where manganese metal, chromium, ferro titanium, ferro columbium, nickel titanium, titanium aluminium, ferro manganese, and other metals and alloys are produced by the Thermit process. The visitors also saw the plant producing ferro chrome, tungsten metal powder, and sintered permanent magnets.

Arc Acetylene

German Production Described

PROCESSES for the manufacture and purification of arc acetylene at the I. G. Farben plant, Huels, Germany, in which hydrocarbons are converted into acetylene in an electric arc are described in a comprehensive report recently released by the Office of Technical Services of the U.S. Department of Commerce, Washington, D.C. ($3.50).

Under the processes used by I. G. Farben chemists, the crude product hydrocarbon gases are first purified by cyclone separators, bag filters, and oil, and finally by water scrubbing. The acetylenes present are then concentrated by solution in water under pressure. The higher acetylenes in this concentrate are separated from acetylene itself by cooling in stages to minus 78° C. The acetylene-free gas is separated into its components in a Linde plant. The processes are novel, involve considerable special equipment, and result in numerous by-products, the report adds.

The use of the electric arc for producing acetylene was started over 20 years ago at the I. G. Farben Ludwigshafen plant and was later further developed at the Leuna plant. In the 1930's the problem was also studied in the United States and between 1938 and 1940 the Huels plant, described in the report, was designed and constructed. The report deals only with that part of the Huels plant in which various synthetic rubbers are produced. From the raw materials, methane and benzene, butadiene is produced *via* aldol, and styrene *via* the alkylation of benzene with ethylene from acetylene. At the time that the Huels plant was investigated in 1947, it was producing about 1500 tons of rubber per month and operating at 50 per cent of capacity. The 134-page mimeographed report, No. PB-81826, entitled "Manufacture and Purification of Arc Acetylene," discusses in detail the arc and carbon separation, the purification steps, and the operations involved in separating product gases. The appendices contain simplified flowsheets of the processes and describe the equipment used, in addition to providing a bibliography of microfilmed documents available on the subject.

Chlorination of London's Water.—Asked in the Commons why London's water was still being chlorinated, Mr. A. Bevan said that chlorination had been the standard practice of the Metropolitan Water Board since 1926. It was regarded as an indispensable part of the various processes of treatment that ensured the purity of London's water supplies.

Training Scientists

Formation of National College

THE training of Britain's young scientists, technologists and research workers is to be speedily developed on a national basis under a scheme, prepared by the Ministry of Education, which envisages the formation of a chain of colleges throughout the country.

A new Council on Education for Industry and Commerce, under the chairmanship of Lieut.-Gen. Sir Ronald Weeks, former deputy-chief of the Imperial General Staff and deputy chairman of Vickers, Ltd., is to be set up as soon as possible.

Sir Ronald will preside over a committee consisting of more than a hundred representatives of teachers, universities, local authorities, employers and trade unions in the Ministry's ten regions, plus up to 20 members appointed directly by the Government.

The council's chief task will be to co-ordinate the activities of the regional organisations and improve training facilities and equipment. It will also deal with such matters as examinations, certificates, scholarships and special awards.

Close liaison will be maintained with the leaders of industry and the professions to ensure that the greatest possible use is made of the nation's brains and technical skill.

New Detergent

The Anglo-Iranian Oil Co. and Scottish Oils, Ltd., announce the development of Iranopol, a new detergent which is being produced at the Pumpherston refinery of Scottish Oil, Ltd., from materials produced by the Scottish oil industry. An associated company, Irano Products, Ltd., of London and Glasgow, will handle the distribution. Prices will compare favourably with those normal soaps, and the detergent is suitable for toilet purposes as well as for industrial uses. It is stated to be unaffected by hardness, and can also be used with sea-water; is regarded as having a considerable future in laundry work, in paper manufacturing, and in catering.

Some £4 million worth of chrome lies buried in dumps at Selukwe, Mashaba, Lalapanzi and Umvukwees, Rhodesia, awaiting transport to its markets. Mining has slowed to the lowest point economically possible, without actually closing down, because Rhodesia's overburdened railway system and the port of Beira cannot carry chrome ore.

REGAINING THE INITIATIVE

FBI President on Effect of Controls

"ACCORDING to the Economic Survey for 1948, without U.S. aid we should be compelled to cut consumption and employment and to abandon many of our development plans," said Sir Frederick Bain, president of FBI, when he addressed its annual general meeting last week following his re-election. "Industry has to-day no information as to the effect of Marshall Aid on the overall raw materials position, nor as to what strings, if any, are to be attached to the Aid. But although we know so little about the plan as yet, we do know that, but for the celerity with which the Marshall plan has been enacted, the true significance of the economic state of the country would have been brought home to every individual through his stomach and through his purse."

Irrelevant Party Ideologies

"The challenge to this country is therefore to use the period of Recovery Aid for what it is intended, 'self-help.' The time is short; there is no time to waste on party shibboleths and ideologies."

Sir Frederick contended that industry's main task was to replace old plant and machinery, to improve efficiency, and to exploit new inventions and discoveries. "There is not one of us who has not felt frustrated in attempting to achieve these things," he said.

Capital Equipment

Capital equipment and machinery, having been one of our most valuable exports, had not been sufficiently available to British industry. That was a policy which from the short-term point of view was justifiable. But to-day there must be a long-term policy, Sir Frederick insisted, and the period of aid from the U.S.A. had to be used primarily for the rehabilitation of British industry.

"The Government must adapt its export policy," he continued, "and industry must be allowed to arm itself to meet the competition of the world. We must get down to true costs as speedily as possible."

The president said he had been particularly interested in the past year to note the development of voluntary action by industry as an alternative to the compulsory methods from which it had suffered since the war. He mentioned some of the principal controls to which industry had been subject:

To ensure the correct use of materials, there had been systems of licensing. To deal with evasion created by the licensing restrictions, there had been authority to manufacture. In order to force manufactured goods on to export markets, home demands had to be restricted by the Purchase Tax.

Price controls, which had been introduced to keep prices down, had in some cases had the opposite effect, because of the way they encouraged inefficiency. Price control, in turn, lead to high profits by the efficient, and to counter this profits tax had been imposed.

Wall of Restrictions

Each new problem had been met by fresh statutory restrictions, leading to still more restrictions to stop up the leaks disclosed by the first, and to grapple with the evasions set in motion by the wall of restriction.

This last point was, in Sir Frederick's opinion, perhaps the most serious of all. "If all our affairs are to be controlled by statute," he said, "we shall encourage a world of black markets, of evasion, of law breaking, the very antithesis of the unity of objective which is the purpose of the controls themselves."

The Government should state clearly the main lines of its industrial and financial policy, and indicate to the various sections of industry the results they were expected to produce. The Federation believed there must be developed a system by which industry could adopt voluntarily and in consultation with the Government its own methods to carry out that policy, so that it could substitute flexible methods for the rigid strait-jacket of the statutory control. There had, fortunately, been a number of examples of consultation between the Government and industry.

Freedom of Action

Nothing could be worse than to have to wait upon Government instructions for all activities, and Sir Frederick hoped that none would yield to the temptation to cling to the comforts of an assured allocation, if at any time there should be a chance to regain freedom of action and of enterprise. He did not see how the Government could justify its continued unwillingness to disclose to industry what is being done with steel, and how the allocations were divided between the different claimant branches of industry. He was not happy about the difficulty experienced in arranging for effective consultation about German industry. But he believed there was a growing realisation that industry had something constructive to offer on such matters, and efforts must be continued next year to make further progress.

Monsanto Claims $50 M. Damages

Sequel to Texas Nitrate Disaster

A $50 million claim for damages was filed last week against the U.S. Government by the Monsanto Chemical Company in connection with the disastrous ammonium nitrate explosion which wrecked Texas City a year ago and killed or injured more than 3500.

The Monsanto Chemical Company, 145 of whose personnel were killed and 205 seriously injured, alleges that the Government was aware of the potential hazards of the ammonium nitrate, but that the chemical was packed and shipped from Government plants labelled solely as "fertiliser."

The company's suit is for loss and damages resulting from destruction of its plant and includes expenses incurred and loss of profits due to the plant's destruction as well as for the loss of the services of technically trained personnel killed in the disaster.

Imflammable Packages

The company also states that the nitrate granules were coated with a waxy material and packed in paper bags containing asphalt interlayers, all of which increased the combustibility of the product and heightened the possibility of fire and resulting explosion. It claims that the Government placed no warnings or precautionary notices on the bags or shipping documents, with the result that persons handling the material were not informed of the highly explosive and hazardous nature of the contents. Furthermore, the company alleges, no instructions for avoidance of fire or for fire-fighting methods were carried on the bags or shipping documents.

The explosion destroyed Monsanto's $20 million styrene plant as well as a new $2 million unit for the manufacture of the plastic moulding compound, polysterene.

Other claimants include the Humble Oil & Refining Company in respect of the loss of 180,000 barrels of oil stored in the waterfront area, the Humble Pipe Line Company for the loss of a further 146,000 barrels of oil, and Mrs. E. J. Comstock, widow of Dr. Charles S. Comstock, technical director of the Texas City branch of the Monsanto Company, who lost his life in the explosion.

Progress in Drugs

Reports from Britain and India

A NEW drug, described as "6257," a chemical derivative of one of the sulphonamide group, forms the subject of an interesting report from a group of Bombay doctors published in the *British Medical Journal*.

It is stated that of 85 cholera patients in 27 Indian villages treated with the drug, 82 survived. This achievement, without parallel in medical records, is rendered even more significant by the knowledge that the patients were treated in their homes without nursing and general medical care, and without additional treatment. The drug was administered orally.

Streptomycin

Of equal interest, is the relative success that has attended the treatment in Britain of tuberculous meningitis with streptomycin. A committee set up by the Medical Research Council to direct and report on this work has published striking facts and figures in *The Lancet*. Of 105 cases of tuberculous meningitis treated with streptomycin at eight official centres in this country, 27 lives were saved, 71 died, and the condition of the remainder was regarded as unsatisfactory. The death rate was highest among children under three years of age, 80 per cent failing to respond to treatment. Better results occurred with older children and adults, among whom effective treatment is reported in 36 per cent of the cases.

Penicillin

A question relating to dollar royalties payable on British-produced penicillin has been raised in the House of Commons by Mr. Woodrow Wyatt, M.P. He challenges the payment to America of large sums for producing the drug that British chemists discovered. He questions the validity of paying dollars to America for the use of mass production methods, and improved procedures of production, which the Americans developed—with our agreement—when such work was found impracticable here under the war conditions then prevailing.

Mexican Mining Congress.—A mining congress held in Mexico City recently has expressed concern at the decline in the output of this important industry. Changes in the tax structure, favoured treatment for mines with a low ore content, an improved transport system and the reduction of the import duty on foreign mining machinery and materials were stated to be essential to secure revival.

NEED FOR RESOURCE

DSIR Chief's Advice to Chemical Engineers

SPEAKING as the guest of honour at a luncheon which followed the annual general meeting of the Institution of Chemical Engineers at the Connaught Rooms, Kingsway, London, last week, Sir Edward Appleton, secretary of the Department of Scientific and Industrial Research, and Nobel prizewinner, said that the modern chemical engineer needed not only knowledge and insight, but also resource for dealing with unexpected situations. Textbooks failed to provide those qualities. Nevertheless, it was resource in combination with knowledge that accounted for the great strides made in chemical engineering in recent years.

Rôle in Large-scale Production

The chemical engineer had the task of translating laboratory results into large-scale production. His task was not easy. It was made more difficult by the discovery of new materials and new production methods. The chemical engineer had to steer a middle course between the seller, tried theory, and practical error, which involved the use of men, money and materials.

Sir Edward suggested that to identify a chemical engineering problem was half-way towards solving it. The other half could be surmounted by resourcefulness, by sagacity, and an insatiable curiosity.

The U.S.A. had made great strides in chemical engineering research and development, and there was no reason why this country should not do so too. Perhaps we were making a mistake in turning out chemical engineers in quantity without adequate attention to quality as well.

Sir Edward caused some surprise and amusement when he suggested that one day the institution might more appropriately be known as the Institution of Atomic Engineers.

In a reference to the re-election of Mr. H. W. Cremer as president of the institution, Sir Edward paid tribute to his wise and successful chairmanship of the Water Pollution Research Board.

In his presidential address, "The Chemical Engineer and Civilisation," Mr. H. W. Cremer said that mankind had been grievously misled by the tremendous growth of material knowledge in more recent years, whereby it had confused mere acceleration with civilisation. Civilisation was far deeper and more profound than that.

There was a very real danger of spectacular scientific discovery and development, when so much new knowledge was brought before people without any effort on their part to acquire it or to understand, for the wider issues of life to be overlooked and for the really lasting qualities of civilisation to be submerged.

The need was surely for wisdom rather than cleverness, for intelligence rather than intellectualism, for understanding as well as knowledge? We had to remember that there was an essential difference in the study of the physical and the human sciences, between the study of particles of matter and of people in society. It was because of his conviction that the profession of chemical engineering should demand of its votaries wide vision as well as knowledge and experience of science and its applications, the human outlook as well as the ability to design plant and works, that he suggested some thought devoted to those matters might not be out of place.

There were many reasons for the somewhat haphazard development of our earlier chemical industries and consequent pollution of earth, sky and water. Only in comparatively recent times had it come to be realised that similar operations could be carried out much more efficiently in surroundings which were clean and wholesome. He liked to believe that the chemical engineer had been one of the chief instruments in bringing about that desirable and happier state of affairs.

"Planning" Abused

It was obviously ridiculous as well as most ungenerous to ascribe our loss of Eden entirely to the pioneers of industry. He suggested that the whole body politic must accept its share of the blame, for it had permitted deplorable happenings without apparently any effective attempt at protest. Seldom, he supposed, had any one term in our vocabulary been so abused as that of "planning." Torrents of words on the subject poured forth daily upon a far too tolerant and complacent public whose power of effective criticism seemed to become more and more atrophied with the passage of time. One of the chief dangers seemed to be that the planners did not co-ordinate their efforts and agree among themselves. He suggested there was a great opportunity for the chemical engineer to bring his influence to bear on the problem, in order that industrial planning might be considered as a whole and not piecemeal.

For too long had it been left to the chemist to propose and for the chemical engineer to dispose where the process industries were

(*Continued overleaf*)

concerned. Broadly speaking, the chemist had tended to rest content, having adumbrated the process, and the mechanical engineer had been inclined to restrict his interest to the mere mechanisation of that process in the light of what the chemist had been able to explain about its requirements.

Modern industry required more imagination than that; it needed a consideration of the results of operating the process. He was concerned lest the present great urge to "develop" our Colonies, Protectorates and the like might result in the same haphazard growth of industry and subsequent desolation as had followed in its wake in the home country—townships ravaged by fumes from chemical works, rivers polluted, mineral resources unwisely exploited, and so on. The chemical engineer could exercise a profound influence for good.

"Seeing Things Clearly"

The chemical engineer had come to be regarded by those who knew him intimately—and the president believed rightly so—as a person who saw things clearly and saw them whole. Few other professions had taken such trouble to create in the minds of their initiates such a blend of the pure and the applied sciences, such an appreciation of good and bad, where manufacturing technique was concerned, and to equate those with that knowledge of mankind and its habits without which a really balanced judgment could not be achieved, nor that forward looking which the makers of industries had all too frequently lacked in the past.

The chemical engineer had also a big part to play in bringing about not only industrial but also public enlightenment. Was it not a worthy assignment for the chemical engineer, who saw at such close quarters the ill-effects of mis-applied or imperfectly applied science, to interpret and to guide? The chemical engineer should exert a steadying influence in a world that had rather lost its sense of values. There would be opposition, but if he were worthy of his calling he had long since realised the truth of Ibsen's words: "One should never put on one's best trousers to go out to battle for freedom and truth."

At the annual meeting of the Institution which preceded the luncheon, Mr. L. O. Newton, joint hon. secretary, presenting the report of the council for 1947, drew attention to an increase of membership to more than 2000.

Of education in chemical engineering, which had continued to occupy the close attention of the council, he said the bursaries granted by the Institution in 1946 to Mr. V. L. Jarvis and Mr. A. E. Kerridge were renewed for a further year. The special short-term full-time courses set up by the Ministry of Education and the Ministry of Labour and National Service were still in operation and the Institution had appointed as assessors for those courses Mr. H. Griffiths and Prof. D. M. Newitt for Battersea Polytechnic; Mr. W. C. Peck and Mr. S. B. Watkins for the South West Essex Technical College, Walthamstow; Prof. F. H. Garner and Dr. W. Preston for Loughborough College; and Mr. T. Penny and Mr. E. Woollatt for Bradford Technical College.

The report showed that many members of the Institution had been appointed to universities overseas, particularly Sydney, Adelaide and Queensland.

Discussions had been continued with the Ministry of Education with regard to the possibility of National Certificates in Chemical Engineering. At the annual examination for associate membership of the Institution in 1947 there were 47 candidates. For the current year the number was more than 100, an indication of the increasing appreciation of the value of the Institution's diploma.

Mr. F. A. Greene (hon. treasurer) presented the accounts for the year, which showed that revenue had increased by about £1000; there had been increased expenditure, but the net result was a small surplus for the year.

The officers and council elected were as follows: Vice-presidents: S. Irwin Crookes, V. F. Gloag, J. McKillop, J. Davidson Pratt; joint hon. secretaries: M. B. Donald and L. O. Newton; hon. treasurer, F. A. Greene; members of council: F. A. Freeth, A. H. Lynn and F. E. Warner; associate member of council, E. H. T. Hoblyn.

Awards

Medals for 1947, with certificates, were presented as follows:—

The Osborne Reynolds Medal to Mr. Norman Swindon, for his valuable services to the Institution, particularly in connection with the work of the publications committee; the Moulton Medal to Dr. H. Heywood, for his paper on "The Scope of Particle Size Analysis and Standardisation"; the Junior Moulton Medal and books to Dr. Edgar T. Moss (graduate) for his paper on "The Mixing of Liquids by Injector Action"; the William Macnab Medal to Mr. D. Ormston for the best set of examination papers submitted in the 1947 Associate-Membership examination.

Tin Allocations.—The Ministry of Supply announces the following interim allocations of tin metal by the Combined Tin Committee for the first half of 1948 additional to those previously announced: Brazil 700 tons, Austria, 200 tons.

Team Work in Engineering

Sir F. E. Smith's Advice to Ministry of Supply Group

A STRONG appeal for closer co-operation in the engineering industry between research workers, designers, producers and users, was made by Sir F. Ewart Smith (I.C.I., Ltd.) in the course of a lecture on "Engineering in the Chemical Industry," delivered to the Ministry of Supply Engineering Association on Wednesday of last week.

The lecturer, who was chief engineer of armament design in the war, was introduced by Lieut.-General F. G. Wrisberg, president of the association, who briefly described the formation of the organisation 18 months ago and said that it provided a specific field for the exchange of scientific technical and engineering knowledge within the Ministry. The increasing competition in our export markets demanded a higher standard of quality in production and this in turn could only be attained by efficiency, team-work and co-ordinated effort.

Lag in Practical Applications

Sir Ewart began by saying that Britain was still supreme in the development of new ideas in the engineering industry and that nowhere was this fact more widely recognised than in the U.S.A. It was in the practical application of knowledge that we lost ground. Work was done in this country by small groups instead of co-ordinated teams and this hampered our efforts to outstrip foreign competition. The historical development of engineering technique in this country had largely contributed to small-group working. Other countries had started this development at a much later period and faced problems with a freshness of approach we would do well to study.

Training of Engineers

To-day, in the engineering industry, we must have more trained minds. Whether recruits came from the universities, training schools or drawing offices it did not matter as long as they were the best of their kind. "Schools," he said, "should be places where students are taught to use the tool of knowledge. The examination system, which hinges even yet on how many facts a student knows is retrograde and stifles initiative."

America to-day was training something like 15 times as many university engineering students as Britain. Irrespective of quality, such wide-scale tuition must ultimately produce a considerable advantage in the application of technical knowledge.

As an illustration of how team-work between the research and design units, together with the assistance of the manufacturer, provided a rapid transmission of new ideas into practical use, Sir Ewart screened lantern slides showing the evolution of forged high pressure vessels used in hydrogenation processes from the mid-twenties until just before the outbreak of war. Other slides depicted developments in high pressure gas circulators and injectors for liquids.

Sir Ewart concluded by offering a slogan for designers—"Simplicity and symmetry." Maintaining those principles should form the basis of approach to all engineering construction, no matter how complex.

New British Standards

Paints and Water Treatment

THE British Standards Institution has recently published a revised "Colour Card for Ready Mixed Paints" (B.S. No. 381C: 1948) which provides an amplified range of 93 colours, 61 of which appeared in the 1930 edition. Twelve of the original colours have been amended to correspond with the usually clearer colours produced by modern pigments, four have been deleted and 32 new ones added. A new grouping system, based on seven broad colour divisions, gives every colour a three digit reference number, the first digit indicating the group and the last two digits the number the colour had in the previous card. Another publication, "Treatment of Water for Marine Boilers" (B.S. No. 1170) contains sections dealing with the maintenance of boiler plant and the principles of chemical treatment of water.

In addition, there are appendices giving detailed accounts of recommended testing methods and specifications for chemicals and reagents in the control tests. Two further British Standards which have been prepared are: B.S. 1328: 1946 "Methods of sampling water used in steam generation, and B.S. 1427:" Tests for water used in steam generation" (group A control test for which no laboratory is required). The latter standard has not yet been published, but will be available shortly. Prices are: B.S. No. 381C: 1948—4s.; B.S. 1170—10s. 6d.; B.S. 1328—3s. 6d.; all post-free from the British Standards Institution, Sales Department, 24 Victoria Street, London, S.W.1.

Increased Collaboration Urged

BCPMA Chairman Approves "Planned Economy"

"WE all realise to-day that there is the need for a vast expansion in the production of capital plant for the chemical industries at home and abroad. The production of chemicals throughout the world is becoming one of the dominant factors in the economy of the different nations. The Government is conscious of that and has emphasised to us the place which the manufacture of capital chemical plant must play in the nation's economy in the future."

So said Mr. A. G. Grant, in an address to the British Chemical Plant Manufacturers' Association, following that organisation's annual general meeting, at which he was elected chairman for 1948.

A Distinction

There has (he said) been a certain amount of discussion about expanding the chemical plant industry. I would like to emphasise what our executive committee has felt, that the industry represented here to-day has the ability to meet the expanding calls upon it. I say the "ability" and not the "capacity" because, in our chemical engineering world, capacity is subsidiary. We can harness additional capacity if it so becomes necessary.

To exercise this ability under to-day's conditions there must be a certain co-ordination of our efforts. The difficulty to-day is that our traditional approach does not quite meet the case. To exercise initiative in the old manner of private enterprise needs free access to materials, money and markets. We have not that free access to-day. We may quarrel with the reasons for it, but the situation exists and is unalterable. So that in a world which is more integrated than ever before and yet more crazily anarchic, the Government, partly by design, partly by dire necessity, has been impelled to plan the economy, the housekeeping, of the country and it must have some hand in pointing the direction in which all of us proceed.

Perhaps it is not out of place to draw your attention to the changing shape of industry in two particular respects. First of all is the changed function of associations. Trade associations as originally conceived 20 or more years ago, and particularly those with no concern for price matters—as in the case of the BCPMA—were in a great degree advisory and in the nature of information bureaux. They were worthy of support, but more than anything else for the intangible value of periodic meetings and the personal associations they created.

To-day, I suggest, the problem confronting industrial firms collectively are immediate and vital ones, and the leisurely mechanism of committee deliberations, minutes and circulars is as little appropriate to a trade association as it ever has been to a business concern. A permanent staff with a considerable measure of executive powers is necessary. The BCPMA has developed in that direction.

The second major development I have in mind is the part the Government is taking in directing of the affairs of industry. There are mixed views about this business of Government and industry. I do suggest that those who have adverse views possibly lack an understanding of the sort of relations that ideally should exist between the Government, through its various Ministries, and industry.

Planning Unavoidable

I believe that the planning of broad principles at a high level of industrial activity, if only to give effective use of man-power and materials, both in short supply, is necessary, desirable and unavoidable. I also believe that under democracy we have not yet learned how to do that planning. I mean that we have not yet learned how to attain the desired ends with the fullest scope for individual imagination and enterprise by instituting enlightened direction at high level and using controls at key points only.

Why should we? We have had thrust upon us this colossal task in a time of chaos following a world war, and it is too big a thing for us to have understood and developed in these few years.

I do think that we—and I mean both the Government Departments and collective industry—have a great deal to learn in collaboration and in planning.

New Coal Seams

Drillings on farmland near Shifnal, Shropshire, have disclosed two seams of good coal 5 ft. and 2 ft. wide. The seams, 1600 ft. deep, have been discovered by the "mud-flush" system, never previously used in coal-borings. This is said to operate ten times quicker than ordinary methods, mud from the bore giving a complete cross-section of the strata. Further drillings are to be made.

Ciba's Mounting Profits

12m. Swiss Francs for Research

AN allocation of 12 million Swiss francs to finance research activities has been made by the international chemical firm, Ciba, Ltd., of Basle. This is one of the principal items in the 1947 balance sheet (THE CHEMICAL AGE, April 17) which reveals that the net profit rose from 11 million Swiss francs in 1946 to nearly 15 million in 1947. A dividend of 14 per cent is to be paid on the increased share capital of 60 million francs as compared with 20 per cent last year.

The extent to which this substantial increase in profits is due to the structure of Ciba, Ltd., with its subsidiary companies correlating research and developing trade in the various countries, therefore avoiding constant international monetary exchanges with the parent company, is revealed in the 1947 report.

Research in Dyestuffs

The report states that in the field of dyestuffs and auxiliary products for the textile industries the marketing of Ciba products presented no difficulties, despite the increasing activities of foreign competitors. This applied particularly to the European markets.

The organisation has intensified its research work on dyestuffs, emphasis being given to the production of dyes with special fastness properties and applicable to fabrics finished by processes involving the use of synthetic resins.

The parent company also reports an increased output of pharmaceutical products, despite the rise in competition and a declining price trend.

Importance of Subsidiaries

The report states that the deteriorating foreign exchange and transfer position has enhanced the importance of foreign subsidiaries. Examples quoted of Ciba's subsidiaries which are developing the scope of their products, are the Clayton Aniline Co., Ltd., Manchester, and the Cincinnati Chemical Works, Inc., U.S.A. A rise in export business also accounts for improved trading by Ciba Laboratories, Ltd., Horsham.

The report adds that the French and Italian companies show a substantially improved position but steps taken against the nationalisation of the Polish unit, the Company for Chemical Industry, Pabianice, have so far not been successful.

More Technologists Needed

Education Minister Agrees

THE minutes of a recent meeting of the Parliamentary and Scientific Committee reveal that a deputation from the committee received a favourable reception from the Minister of Education—Mr. Geo. Tomlinson—when they met him in the House of Commons in February last. The purpose of the meeting was to urge the Minister to increase the number of highly-trained technologists in the country, and to make suggestions as to how that objective could be achieved. The Minister had already received a report from the committee on Colleges of Technology and Technological Manpower.

In his reply, Mr. Tomlinson said that the report followed very nearly the policy of his Ministry, and he agreed to the need for an increased number of highly trained technologists. His department intended to give the educational machinery full scope, so that the needs could be met as rapidly as possible. The question of a degree (which it was suggested technical colleges should develop for themselves) would be submitted to the National Council. Regionalisation had been carried out and Regional Boards set up. The Minister agreed with the desirability of close collaboration between the universities and local technical colleges. Referring to another suggestion that a National Council of Technology should be established, the Minister thought that this would be too cumbersome, as such a council would need to be representative of all the Regional Boards. The Ministry were setting up a National Board, which would consist of a large representative body, with one or two sub-committees.

Other Ministerial Points

National colleges had been established for several industries, and the setting up of a Wool College was being considered. There would be an increase in the number of technical State scholarships immediately there was a sufficient demand. Loan funds for colleges of technology were not viewed favourably. Alleged inadequate publicity with regard to the technical State scholarships would be looked into. The Minister shared the view that the status of technical colleges must be raised.

The deputation was made up as follows: Mr. M. P. Price, M.P., Mr. W. T. Wells, M.P., Mr. H. Linstead, M.P., Mr. I. Pitman, M.P., Dr. T. J. Drakeley, Dr. J. R. Scott, Mr. Cecil Dixon, Dr. W. R. Wooldridge, Dr. H. R. Lang, accompanied by Commander Christopher Powell.

U.S. Gas Synthesis Project

Exploratory Plant to Cost More Than £1 Million

A CONTRACT worth more than £1 million ($4,413,250) for the design and construction of a gas synthesis (Fischer-Tropsch process) demonstration plant to be erected near Louisiana, Missouri, to produce oil from coal was awarded last week to the Koppers Company, Inc., of Pittsburgh, Pennsylvania. Mr. Joseph Becker, general manager of the company's engineering and construction division, has stated that the company will start engineering work at once and that the actual construction work will probably start within three months. He added that it is expected that the synthesis plant will be in operation within 15 months.

This is the third and last of the demonstration or semi-commercial scale plants planned under the synthetic liquid fuels research and development programme of the Bureau of Mines, and it reveals a number of interesting departures from earlier practice. The development of this project will utilise the Kopper Company's background of experience in coal gasification, oxygen production and use, and gas purification as well as the Bureau of Mines' extensive research background on gas synthesis to produce liquid fuels. The new unit will have a capacity of 80 barrels of oil and gasoline daily and will include a coal gasification unit.

Based on Coal

The gas synthesis plant will be erected adjacent to the Bureau's hydrogenation (Bergius process) demonstration plant, now under construction near Louisiana, Mo., on the site of the Missouri Ordnance Works, a wartime synthetic ammonia plant. The 200-barrel-a-day hydrogenation plant is expected to be completed next summer. Both plants, although using different processes, will employ coal as the raw material for liquid fuels. An oil-shale demonstration plant already is in operation near Rifle, Colorado.

At present the importance to the national economy of the production of synthetic liquid fuels from coal has been thrown into sharp relief by the recent widespread shortage of fuel oil and gasoline.

Closely synchronised with synthetic fuels research and development laboratories at Bruceton, Pennsylvania, and Morgantown, West Virginia, the coal to oil demonstration plants at Louisiana, Missouri, will serve as a proving ground for promising processes developed by Bureau of Mines scientists in laboratory and pilot plant. As a pattern of scintific, engineering, and economic knowledge is evolved, it will be made available to private industry for application in plants of commercial size (10,000 barrels or more daily capacity).

The plant site—less than 100 miles above St. Louis on the Mississippi River—is centrally located with respect to the major U.S. coalfields. Coals and lignite from these fields will be tested in the demonstration plants for their processing characteristics and liquid fuel yields.

Many Products

The gas synthesis or indirect Fischer-Tropsch process, with American modifications, to be used, is well adapted to the production of either a good grade of motor gasoline or an excellent Diesel fuel. By-products include wax, alcohols, and hydrocarbon gases. Through cracking, the wax can be converted to diesel fuel and lubricants, or it may be used directly in polishes, insulating materials, and chemicals. The alcohols are also useful in the chemical industries.

Incorporating the advances made in the Bureau's broad programme of research on the Fischer-Tropsch process, the demonstration plant will consist of four distinct parts: (1) coal gasification, (2) gas purification, (3) hydrocarbon synthesis; and (4) refining of products.

Gasification

Coal gasification, the first phase of the over-all process, also is regarded as the primary research problem requiring further study. Cheap production of synthesis gas is the "pass key" to the successful manufacture of liquid fuels from coal.

For this reason, the Bureau of Mines has chosen to concentrate the efforts of a substantial part of its synthetic fuels and coal research staffs on different phases of this problem. Four methods are under intensive study, and encouraging progress is being made. These include (1) gasification underground; (2) gasification of pulverised coal in superheated steam and oxygen; (3) gasification of powdered coal with oxygen and steam in a vortex reactor; and (4) gasification of lignite and sub-bituminous coal in an externally-heated Parry retort.

Initially, the demonstration plant will employ pulverised coal feeders and a coal gasification unit developed by the Koppers Company which will permit the use of any coal from anthracite to lignite. Priority will be given to this.

To supply oxygen for the coal gasification unit, a 23,000 cubic-foot-per-hour Linde-Frankl oxygen manufacturing plant brought from Germany is already being erected, together with a 50,000 cu. ft. oxygen gasholder. This plant, which will extract oxygen from the air, is the first unit of this size to be erected for coal gasification in the U.S.A.

Pulverised coal will be fed to a reactor at a rate of about 28 tons daily, together with oxygen, carbon dioxide, and steam. The reactor will operate at 2500°F. and 10 lb. p.s.i., and will have a production capacity of 143,000 standard cu. ft. per hour. Heat content of the manufactured gas will be absorbed in a pebble exchanger, whence the gas will go to a gas scrubbing tower.

So far as is known, this will be the first attempt in the United States to make synthesis gas *via* the pulverised coal gasification route. A carbon monoxide generator of conventional type will be provided as an auxiliary source of synthesis gas and hydrogen will be obtained through operation of an existing natural gas catalytic reformer.

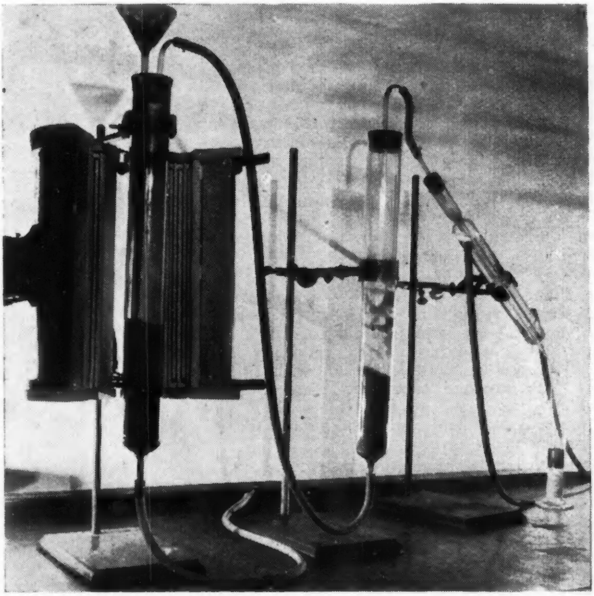
The installation is complicated because of the necessity of providing elaborate purifying plant to bring the gas within the exacting standards required; sulphur content, for example, may not exceed 0.1 gr. per 100 cu. ft.

Synthesis

For the subsequent synthesis reaction internally cooled converter units recently developed in the Bureau's laboratories will be employed. An effective answer to the heat of reaction problem, which limited converters used in German plants to a capacity of 18 barrels a day, units of the internally-cooled type can be built to produce as much as 500 barrels or more of liquid fuels daily.

The synthesis units will consist of one first-stage converter and one second-stage converter, both approximately 5 ft. interior diameter and 24 ft. high. Provision will be made for flexibility of operation and for carbon dioxide scrubbing of synthesis gas prior to the first stage or between stages. These synthesis converters or reactors will be packed with a granular catalyst and will be designed to operate in any one of three possible ways, as follows: (1) with a hydrocarbon liquid flooding of the converter and synthesis gas entering at bottom; (2) with non-flooded converter and gas and a liquid coolant entering at top; (3) with non-flooded converter and liquid coolant entering at the top and gas at the bottom.

The U.S. project in embryo—a laboratory scale apparatus fed with pulverised coal, in which several of the reactions involved in the full-scale plant have been carried out



The New Electron Microscope

A Versatile Aid to Research

THE electron microscope designed by Dr. G. Liebmann in the research laboratories of Cathodeon, Ltd., has now been described by him in a paper read before the Electron Microscope Group of the Institute of Physics. The instrument presents features which distinguish it from the known types as dealt with by Zworykin and others (*New Electron Optics*—New York: John Wiley & Sons, 1945).

It may be used as a self-contained desk model, employing four permanently aligned magnetic lenses and optical magnification; it incorporates a new type of specimen stage, facilitating quick exchange of specimens; wide angle stereoscopic observations and direct calibration of specimen position; improved electron gun; and exchangeable camera head. The instrument can be quickly adapted for electron diffraction observations.

Other Applications

This electron microscope, moreover, justifies the hope of further application and development in many directions, *e.g.*, (1) mechanical focusing in which magnification is quite independent of focus adjustment; (2) wide angle electron stereoscopy; (3) selection of small specimen area for diffraction work; (4) application of Hillier & Ramberg's new correction method for astigmatic objective lenses (*J. Appl. Phys.*, 1947, *18*, 48) and (5) modification of present specimen holder to permit introduction of gas atmosphere into neighbourhood of specimen.

A full report with illustrations of Dr. Liebmann's paper has just been published in *Jnl. Sci. Instr.*, 1948, *25*, 37-43, February, to which those intimately concerned will need to refer.

Fig. 1 shows basic design principles. The exchangeable pole piece units—condenser C, objective O, and first and second projectors P_1 and P_2—are kept in rigid alignment and correct relative position by retaining tube AT of non-magnetic material, with sliding fit into another tube, the main vacuum chamber soldered to stage block SB. The iron-clad lens coils surrounding this chamber are not shown.

In order to align the instrument it is necessary only to centre the electron beam between the condenser lens C and the electron gun by means of a rotatable beam deflector coil DC. The gun comprises anode A, grid electrode GR, and cathode F supported by glass sleeve GL.

The view chamber, including fluorescent screen FS and camera with plate-holder PL and shutter SH, is joined to top of vacuum tube by a rubber gland not shown, and the electron gun is joined to lower end of tube in the same way. Both gun and viewing chamber are connected to the vacuum manifold VM which can be separated from air-cooled oil diffusion pump DP by a shut-off valve SV.

The air inlet valve is AV, the vacuum gauge VG and refrigeration unit (cold trap) RU. Specimen SP in the special holder is carried within the rod SR moving in groove in stage block and passing into vacuum through a rubber gland G. Stereoscopic pictures can be taken by rotating the rod SR. A section through the instrument is shown in Fig. 2. The complete instrument can be built into a desk.

In addition to the true stage block there is an inner block housed in the upper part of the iron shroud of objective

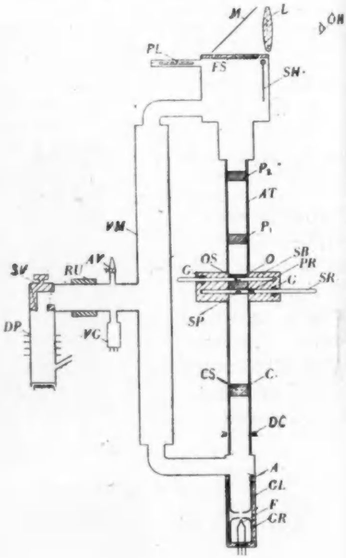


Fig. 1

coil. It is a brass disc carrying a vacuum chamber and glands, having suitable milled grooves in the annular inset. The specimen grid is mounted in a holder which is then inserted in a slot in the specimen rod, so positioned that the specimen plane passes through the axis of the rod without any transitional movement when the rod is rotated for stereoscopic observation.

The outer end of specimen rod is attached to a brass slide moving in slots in the stage block and carrying an auxiliary slide for worm gear drives actuating the specimen movement. Specimen adjustments are direct and can be calibrated so that determination of magnification is simple.

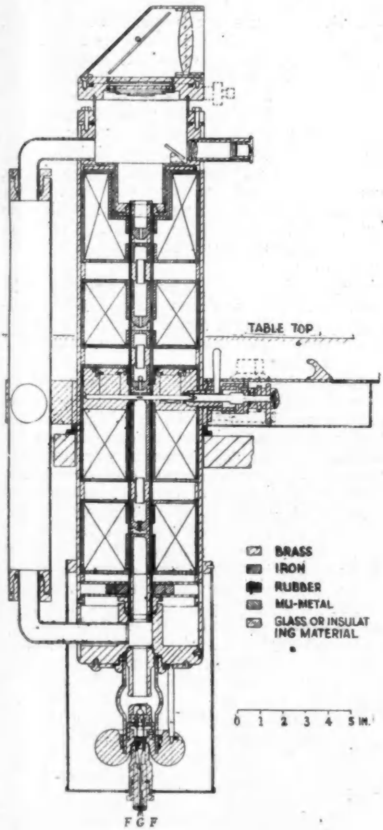


Fig. 2

The electron gun (Fig. 3) is an adaptation of the high current gun originally developed for demountable cathode-ray tubes for large screen television. The cathode filament is a circular loop or short coil of two or three turns, co-axial with the grid perforation, and having an internal diameter slightly greater than grid aperture, so that the anode does not "see" the filament.

This type, which may be called a "hollow cathode," suitably adapted, might also be advantageous in X-ray diffraction tubes. It has other advantages over the usual hairpin filament: current density distributions are much more uniform, and total current delivered into the beam is greater, owing to the greater emitting surface. The magnetic field due to heater current tends to focus slow speed electrons towards the axis, so that a high heater current and thus also a very rigid filament can be used.

Checking Alignment

As the bore of filament coil is greater than the grid aperture, a slight misalignment of the filament within the grid can be more easily tolerated; and alignment of the grid with the anode can be checked by passing a mandrel through the lenses, anode, and grid opening, even when the filament is in position. The accelerating field of the anode passing through the grid opening draws electrons sideways from the filament to the axis, and then away through the grid towards the anode. The high voltage end of the gun is supported by three Perspex pillars from a plate attached to the bottom end of the instrument. In order to renew the filament, the supporting plate and grid cap are removed, and the ceramic disc on which the filament is mounted is withdrawn. The filament coil is then set in a jig for centralising and ensuring correct distance from grid. The gun is reassembled and no further alignment is necessary.

Camera Attachments

The viewing chamber, with its fluorescent screen for visual observation and a photographic camera for recording the electron image, is easily exchangeable. The plateholder compartment is divided from the viewing chamber by an internal air-lock device, so that the image is easily exchangeable. The plateholder compartment is divided from the viewing chamber by an internal air-lock device, so that the camera can be reloaded without breaking the main vacuum. Two shutters on the same shaft are provided, one giving complete exposure of 2 by 2 in. plate, and the

(Continued overleaf)

other 1 by 1 in. pictures on each plate. The equipment includes a built-in low-power microscope for observation of the central part of the picture at very high magnification up to the time of exposure.

Electron lenses are of standard design and of such dimensions that the maximum

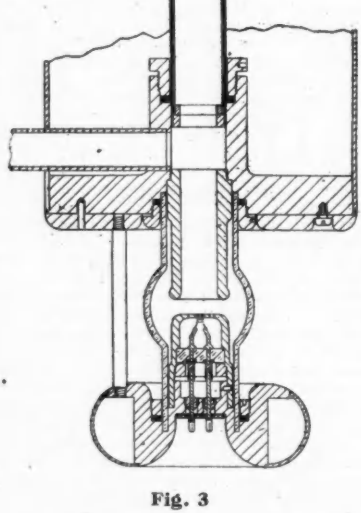


Fig. 3

focusing current at 50 kV requires a dissipation of only about 10 W for each of the three imaging lenses, and 6 W for the condenser lens; so that thermal drift is reduced to a minimum. The coils slide over the vacuum chamber, two below and two above the specimen stage.

The magnetic flux must pass through the tubular air gap represented by the two telescopic non-magnetic tubes located between the inner coil shrould and the pole piece inserts; but, owing to the considerable cross-section area of this gap and its small length, reluctance amounts to only 1-2 per cent of that estimated for pole-piece gap. The pole pieces are of asymmetrical type.

Measurements of refractive power have shown that the spherical aberration of such a lens is the same as that of a symmetrical lens of the same bore and refractive power, but the number of the ampère turns needed is less, so that the specimen may be at short distance from the centre of lens.

The electron beam impinging on the specimen has to be accurately centred (about 0.001 in.), especially at maximum magnification and high values of screen brightness, and special means are provided for this.

There are two aperture stops, one located in the condenser lens and the other in the exchangeable stop of the objective lens near the image end of the focusing field, as recommended by Marton and Hutter (*Proc. Inst. Radio Engs.*, 1944, *32*, 546).

Optical Magnification Stage

The advantages of a final optical stage for visual observation were pointed out some time ago by Ardenne (*Zt. techn. Phys.*, 1939, *20*, 235), as this stage increases the effective aperture of the eye. Such increase, if a magnifying lens is used, is about proportional to the increase in magnification. The practical limit of optical magnification is determined by the size of the desired final image field. In the present case 2.5 × was chosen, thus enlarging fluorescent screen to an apparent field diameter of 10 in.

Magnification, using 4 mm. pole pieces, can be changed continuously from 100 × to 13500 × by adjusting currents in the lens coils, at the same time keeping the whole area of the fluorescent screen filled with the electron image.

Dr. Liebmann's paper concludes with notes on the adjustment of operating conditions for different magnifications; on image distortion, electron diffraction, and electrical equipment.

It may be added that the design of the new microscope has been based on experience in development of high current high voltage cathode-ray tubes with very fine traces. During this work it was necessary to study spherical aberration of strong electron lenses for high current, narrow beam angle electron guns, and to devote special attention to good alignment of lenses.

Thus the same problems met in the design of the electron optical system of the microscope had to be solved; with the main difference that most electron lenses had to be permanently aligned and secured in their relative positions before the electrode structure was sealed in the envelope. Only minor adjustments could be made when the tube was used.

It seemed that principles similar to those evolved in cathode-ray tube work could be applied. Electrostatic lenses were used in the first model, and magnetic lenses in the final instrument.

The courtesy of Dr. G. Liebmann and of the *Journal of Scientific Instruments* in permitting the reproduction of the description and diagrams is cordially acknowledged.

X-RAY DIFFRACTION IN ROUTINE PRODUCTION CONTROL

by H. SEYMOUR

X-RAY diffraction has long been a research instrument widely used in the determination of the basic structures of matter. Latterly its extensive use as an industrial tool has been made possible by improvements in camera design and by the newly developed Geiger counter spectrometer.

Basically the principles of X-ray diffraction are familiar to most chemists. Briefly, it employs the basic atomic structure to provide a means of identification of the various crystalline substances. All crystalline compounds are composed of atoms arranged in layers or planes—"crystallographic planes" and arrangement and distribution of the crystallographic planes is different and characteristic for every compound. No two chemical compounds have exactly the same atomic structure, and no two have all crystallographic planes located at exactly the same distance from each other.

This property of location and distance between crystallographic planes is utilised as an "atomic finger-printing system" by X-ray diffraction analysis. The actual distance betwen the planes may be determined from the X-ray diffraction pattern, and used to identify the substance being analysed.

These are the fundamentals permitting the effective use of X-ray diffraction and spectrometer equipment, which consist of two basic units:

(1) The X-ray generator, consisting of an electrical unit for producing high potential or voltage, and the X-ray tube; and

(2) Equipment for recording the diffracted X-ray pattern. This second item may be one of several special cameras, or it may utilise a goniometer with a Geiger counter and the required associated electronic circuits. The latter unit constitutes the Geiger counter X-ray diffraction spectrometer.

Two types of modern commercial X-ray diffraction equipment are therefore available—one utilising the various special camera equipment, and the other developed especially to employ the Geiger counter spectrometer. The camera equipment varies in design with the type of "picture" required.

The X-ray diffraction spectrometer consists of the following units:—

(1) the X-ray generator, comprising a stabilised transformer and rectifier circuit, operating at 30 kV and 6 ma., and an air-

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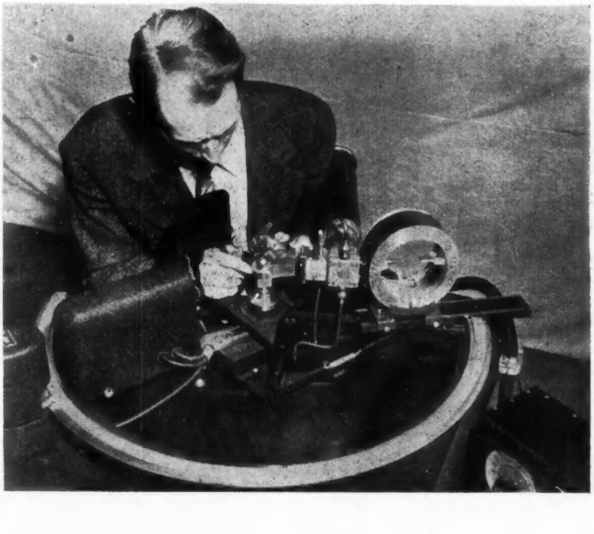

This is one of the latest U.S. instruments for X-ray diffraction of crystalline substances and has a 180° arc for recording critical spacing measurements of which 160° are usable. Powder samples are smoothly packed in the specimen holder and rotated

cooled precision aligned X-ray tube available with either copper or iron targets.

(2) A Geiger counter spectrometer unit utilising a Geiger tube coupled with an electronic amplifying and counting circuit which registers the intensity of the diffracted radiation. The Geiger tube is mounted on a micrometer goniometer, which measures the angulation of the diffracted radiation covering the angle from 0 deg. to 90 deg., with an accuracy within 0.04 deg. The intensity of the diffracted radiation is indicated by a micro-ammeter, or the actual number of discharges of the Geiger tube may be counted by a cyclotron counter.

(3) A high-speed electronic potentiometer strip-chart recorder, which is coupled with the Geiger counter unit, and produces a permanent strip-chart record of the line intensity against the diffraction angle.

In a typical spectrometer chart record the lines of the diffraction pattern are shown as the " peaks " above the base or background radiation, in the same manner as would a micro-photometer trace of the diffraction film. The angular location of the lines is easily determined and the corresponding "d" values may be found in available tables showing diffraction angles compared with the "d" values for the various target materials.

Many Uses

Wide application of X-ray diffraction is possible, extending into the biological, medical, chemical, mineralogical, geological, metallurgical, and other fields, and to many phases of the manufacturing industries covering the materials and processes involved in these fields. Since X-ray diffraction phenomena, generally speaking, apply only to crystals and crystallographic planes, it is usually necessary for the material to be studied to be crystalline in structure. It is true that some research work has been done on non-crystalline or amorphous materials, but the most satisfactory applications, particularly for product and process control, depend upon the crystalline structures of the materials involved.

It should be emphasised that X-ray diffraction analysis is the analysis and identification of chemical compounds and minerals as such. It should not be confused with, nor substituted for, spectrographic and chemical analysis methods, which analyse the elements comprising the materials involve. X-ray diffraction analyses the basic crystalline structure of substances and will, for example, identify the mineral components such as calcite, quartz, feldspar, the micas, the metallic minerals, etc., in an ore sample. It will determine the various alloy phases in a brass sample; the various isomers in a crystalline organic chemical mixture; the crystalline state of a catalyst; the compounds formed in a cement kiln; or the crystal form of a paint pigment.

Limitations

But X-ray diffraction will not determine the percentage of carbon, manganese, or alloying elements in a steel sample, although it will determine the state of heat treatment, or the orientation caused by cold working. It will not assay the gold or silver in a low value prospect sample, but it will identify the minerals present in amounts over about 5 per cent.

General qualitative analysis, as minerals or chemical compounds, is the major application of the X-ray diffraction spectrometer. Comparative analysis of materials is relatively simple, and requires only a short period of time. For instance, the presence or absence of anatase in a titanium dioxide paint pigment can be established in approximately ten minutes, including the preparation of a sample. The identification of a dozen minerals in a complex ore sample would require approximately two hours for sample preparation and the recording of the spectrometer chart.

Quantitative determinations may be made on a comparative basis by the use of standard samples. The spectrometer patterns are compared with those of the unknowns, the relative intensity of the strongest lines indicating the approximate percentage of the various components. The purity of a chemical product may be estimated in the same manner. In general, pure compounds will show well defined diffraction patterns with sharp, intense lines, while impure compounds show diffuse, poorly defined patterns with low intensity and broad lines.

NEW PLASTICS TEXTILE

A NEW woven material with extremely high resistance to chemicals and micro-organisms is being introduced by Fothergill & Harvey, Ltd., of Manchester. This company has the sole marketing rights of the material which they are introducing under the registered trade name of " Tygan."

Tygan is woven from extruded monofilaments developed in Britain by B.X. Plastics, Ltd., and known as " Bexan." The qualities of these monofilaments will be varied to suit particular uses. At present, Bexan is extruded in gauges 0.010 and 0.012. Research work is being carried on to produce still finer threads. One of the promising uses of the new material is as filter cloth.

BRITISH INSTRUMENT MAKERS' CAMPAIGN

Uneconomic Competition from Germany

by J. E. C. BAILEY, C.B.E.

(*President of the Scientific Instrument Manufacturers' Association*)

We all know the great value of British scientific instruments as exports. They are unique in the small quantities of raw materials involved and the high proportion of labour required, so that it is,

Mr. Bailey

in short, "brains" that the industry is exporting.

With the increased level of German industry, new problems have arisen regarding the disposal of German scientific instruments in the world's markets. The policy of the Control Commission is said to be that world prices are to be charged for German production, but it now appears that prices chosen, possibly through lack of knowledge, are such as to compete with the products of the victorious nations.

Information has lately been submitted by a laboratory furnisher at The Hague, through our Embassy there, to the Export Promotion Department of the Board of Trade which indicates the anxiety caused by the fact that German exports are greatly lower in price than their British counterparts. The example given related to a range of laboratory porcelain ware: the German prices are just one-third of the British prices.

It is no exaggeration to say that the war potential of the scientific instruments industry in Germany, its size and what is more, its competition which is already being encountered, is, of course, causing grave anxiety throughout the industry, and particularly to those sections which are meeting the competition first, namely, the optical instrument section and those engaged in the manufacture of analytical balances.

In England the small but virile scientific instruments industry has traditionally received little encouragement from any official quarter. That is confirmed historically by the Admiralty's indifference to the lively young optical glass enterprise in the 17th Century, and currently by the small allocation of steel in the immediate past and now by the fostering by the Allied Control in Germany of revival of pre-war competition on a price basis which ignores economic facts. Prospects for the British industry might be unpropitious, were it not supported as it now is by an exceptionally enterprising spirit and championed by an energetic organisation, the leader of which has provided this exposition of the home industry's relationship to the revived activity in Germany.

SIMA has kept in continuous contact with the corresponding industries in America and France both by visits and correspondence and has lately had a letter from the chairman of the Scientific Apparatus Makers of America, saying that they have prepared a very powerful brief in this matter and have now presented it to the Army and Navy War Production Board.

These, briefly, are the central facts of the current situation. To appreciate how it arose it is only necessary to recall some of the factors which have shaped the post-war direction of the German industry.

It was in March, 1946, that the four Powers issued the figures for the level of German industry, which in the case of the scientific instrument industry, as a whole, was to be Rm.340 million, purporting to represent 80 per cent of a normal peace-time year, which was stated to 1936.

Of these Rm.340 million, Rm.220 million was to be utilised in fulfilling home requirements in Germany, while Rm.120 million was to be utilised for the export trade. These figures were based on the pre-war value of the Reichmark.

The scientific instrument industry in this country protested very strongly against these figures, and was supported by the industries in America and France. The objection was mainly on two grounds :—

(1) War potential.

(2) That the figure of Rm.340 million was excessive.

In dealing with the question of war potential in Germany, the controlling authorities under this heading have prohibited the manufacture of such things as synthetic petrol and synthetic rubber, but appear to have completely overlooked the fact that the real war potential of any country, particularly in Germany, is the scientific instrument industry, the one that supplies all the tools for the scientists by which all inventions are made possible.

On the subject of inventions in war, the "V" weapons come readily to mind. These were only produced by the skill of the scientist with the aid of his instruments.

The German Threat

It is interesting to record that in the November 22 issue of *Nature,* there is a report of the first meeting of the German Physical Society held in the British zone at the University of Gottingen. According to this article, some 500 German physicists assembled, and the narrator, in his article, makes the statement that there is no doubt that organised physics in Germany has now recovered from the stagnant aftermath which followed defeat and active research is being conducted from many centres.

Another factor of war potential is that of research, and it would appear that the control of industry in Germany, never very great, is now non-existent, and it is safe to say that the controlling authorities have no knowledge of any research that is going on.

A complete survey of the industry throughout Germany after the war, revealed that it had suffered very little damage through enemy action, and, in fact, was 90 per cent intact.

The size and potential of the scientific instrument industry in Germany is perhaps best brought home by the fact that investigation has proved that the industry had expanded so much by 1939 that after war was declared no further expansion was necessary, as the industry was sufficiently large to fulfil all the demands made upon it from the fighting services, including "V" weapon production.

In contrast with Germany the position in England is seen to be entirely the reverse. In Germany, plant, machinery and men are available in full measure, production is mainly held up by shortages of raw materials, not forgetting the difficult food position. In England we are extremely short of plant, machinery and men, and are suffering the same acute shortage of raw materials. In this country, the industry expanded during the war into premises of non-essential industries. These have since been evacuated and practically no expansion of the industry has been permitted, and it is therefore now down to something less than two-thirds of its size during the war years.

The policy put forward by the Scientific Instrument Manufacturers' Association for dealing with the German production was that it should be harnessed, wherever possible, to the industry in this country by the manufacture of component parts in the main, or complete instruments where necessary.

If this were carried out it would in turn greatly increase the production of scientific instruments in England, which would enable the industry here not only to meet, in much quicker time, the urgent needs of the home market, but also to expand considerably the export market. This would have the dual effect of bringing additional much-needed foreign currency to this country, and of course, the proper current rates would be paid to the industry in Germany for all their production, which would in turn fulfil the four Powers' requirements of making Germany self-supporting.

Instruments for Export

In England to-day every effort is being made to increase exports and the scientific instrument industry is an ideal industry because its conversion factor is of the highest order. The raw materials involved in the main are negligible and the power factor required to fabricate is equally small, but it is the skill of the designer and the craftsmen which finally produces a first-class scientific instrument; in short, it is brains that the industry is exporting.

Before the war Germany was the main exporter of scientific instruments, achieved not through her superior skill in production but by subsidies. The industry in this country naturally looked forward to obtaining a fair share of the world's markets on the basis of fair competition, and it is therefore very disturbing to receive more and more instances of German instruments being exported to various countries at prices very considerably lower than the comparable instruments of British or American manufacture.

The policy of the Control Commission is stated to be that world prices are to be charged for German production, but when the joint Import-Export Agency was set up, anxiety was expressed that, possibly through lack of knowledge, competition would be experienced from the Agency and this

anxiety unhappily appears to have been only too well founded.

War potential, of course, is also bound up with export trade. Before the war, Germany had agents in every country throughout the world and as the laboratory is always involved, contact through this medium is more likely to uncover research going on in other countries, and this method was largely used by Germany before the war.

To sum up the industry's views on the question of Germany generally, it is considered :—

(1) that the scientific instrument industry in Germany should be strictly controlled and all research should be under constant supervision;

(2) that the level of German industry should be fixed at a sum not greater than Rm.280 million, representing 80 per cent of a genuine peace-time production of Rm.350 million;

(3) that the scientific instrument industry in Germany be harnessed to assist industry here as outlined in the paragraphs above;

(4) that the value of the Reichmark should be fixed without further delay and on a basis of Rm.8 to the £, which would bring it into line with current costs of labour and raw materials in this country.

A Wrong Policy

The policy of the Foreign Ministers of promoting maximum production by the German industry is dictated by the desire to make Germany self-supporting at any price and the significant words are "at any price." Unless the policy is changed quickly, it is my view that the price to be paid is no less than the sacrifice of the scientific instrument industry in this country, with its eventual return to its very small dimensions as existed between the two wars.

The scientific instrument industry in Great Britain met all the demands made upon it during the war. I am convinced that it has an equally important rôle to play in peace-time as in war-time; indeed, I feel that if the industry is given every assistance now in its limited demands for expansion, granted priority for its small requirements of raw materials, it will prove the master key which will open the way to greater production in all other industries, and provided equal conditions exist in other countries, it is prepared to meet all competition on merit alone.

(*A fuller exposition of the factors affecting the British and German industries, which are summarised here, appeared in a recent issue of "Instrument Practice."*)

Fuel Economy

Minister Announces New Plans

RECONSTITUTION of the existing fuel efficiency committees was announced last week by Mr. Hugh Gaitskell, Minister of Fuel and Power, who said that he had decided to put them on a new footing with wider terms of reference and a wider field of membership.

Set up in 1941, under the chairmanship of Dr. S. Grumell, the Fuel Efficiency Committee has been active in furthering all aspects of the efficient use of fuel and power. Previous committee members have agreed to serve on the new body, of which Dr. Grumell will continue to be chairman. Other experts in various branches of fuel technology, and additional representatives of industrial and domestic consumers have been invited to join. Nomination of members of employers' and trade union organisations will ensure liaison between both sides of industry.

The new terms of reference are as follows : "To advise on the application of measures promoting economy and efficiency in the use and consumption of fuel and power; to survey the progress of the organisations established for this purpose; to report the problems arising from these surveys which appear to require scientific investigation; to advise generally as to the lines on which a policy designed to raise the standards of utilisation of fuel and power can best be implemented."

"PLAY THE GAME"

SPEAKING at the presentation at Edinburgh last week of the Mitchell-Hedges trophy to Scottish miners for the best output record for 1947, Sir Charles Reid said disputes in the coalmining industry were piling up week by week. He continued :

"The Board ask me to state this is a position we cannot tolerate. It is a serious matter that after you get the industry nationalised you are not prepared to play the game with the country. I hope everybody will take this to heart and realise that you are not only hurting yourselves but the country as well."

Of mechanisation he said : "We are putting into the pits day by day great masses of machinery, and it does not seem to matter what we do, output a man is not rising. There is something wrong somewhere. The Scottish figures are not too good; there is a slackening of effort despite all this machinery."

Last week's total production figure at 4,223,000 tons represented a decline of 40,000 tons on the previous week, despite a higher opencast production

Laboratory Supplies in 1948

Gradual Return to Normal Production

DURING 1947, and early 1948, supply of laboratory apparatus has generally improved steadily in the main lines of production, but there are still a number of very serious gaps which are giving everybody a lot of worry. If one considers first of all the supply of the more ordinary apparatus,

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THE extent to which manufacturer of laboratory and associated small equipment have overcome the adverse conditions in which the industry has had to operate is shown by the comparatively wide field in which considerable advance has been made in the production of new equipment and the substantial modification of existing types. These evidences, taken in conjunction with the maintenance of a reasonably full supply of general equipment in constant request, represent no small achievement and indicate a continuing spirit of enterprise.

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such as beakers and flasks, it is apparent that the supply has actually improved slightly in all the smaller sizes, but from most of the big makers the output is still not adequate. There do appear to be signs of improvement, however, but it is not likely to be very rapid, and at present if the goods are not available from stock there may be delays of from six to nine months in the delivery of any particular size.

In the larger sizes, *i.e.*, 5-litre and over, delivery has been particularly bad, due in some cases to trouble with glass furnaces which have not been working efficiently, and have, therefore, made glass which is not suitable for large articles, which cannot economically be scrapped. The position is showing signs of slight improvement, however, and a substantial change may be seen by the end of the year.

Lack of Craftsmen

All ordinary thermometers generally are readily available, but the number of craftsmen capable of making special thermometers is extremely small, and many of these have had to be used to train unskilled people to make the routine types. In consequence, delivery of all special thermometers has fallen further and further behind, and it is common for 12 months to elapse before an order can be fulfilled.

There does not appear to be any immediate prospect of an improvement in this position, and it will probably be maintained that there is here a real case for importation from Germany, as it will take a considerable time to train enough new men to the standard required for special work.

Graduated glassware is now available with immediate delivery for the more standard sizes and types, excepting large cylinders. There has been a very serious delay in the supply of blanks for graduating, with the result that the supply position has got badly out of hand on the larger sizes. There are already signs of recovery, however, and the position should have improved before the end of the year.

Supplies of blown glassware in general have been increasing rapidly during 1947. Exceptions have been appliances having ground parts attached. Blown and graduated ware is also catching up very quickly, but the supply of ground parts has been very seriously held up, and any apparatus employing taps or grinds of any sort has been automatically delayed.

Improvement by Autumn

Drastic steps to remedy this position have been taken by many members of the industry, and their efforts are now bearing fruit. Within six months, it is thought, the position will be transformed. Even the supply of standard ground joints of certain sizes is already showing a vast improvement.

The provision of an adequate number of taps, etc., would ease the supply of so many other pieces of apparatus that, in general, the average laboratory may find that almost all its requirements of blown and graduated glassware will be on a six months' delivery basis by the end of this year. That improvement should continue steadily.

Steps to remedy the shortage of laboratory balances have swiftly borne fruit, and the normal good analytical type, and the cheaper type in a case or on board for industrial purposes are available from stock or subject to very short delay. Air damped types, however, are likely to be considerably harder to procure for some while, and microbalances even more so.

Here again the hold-up is due solely to the supply of craftsmen, and no very quick change can be expected in the position.

Almost all scientific departments are acquainted with the difficulties associated with replacing ordinary laboratory metal ware, such as clamps, bossheads, retort stands, etc. This may be attributed almost entirely to the appalling position of ferrous casting

supplies. The substitution of aluminium would automatically raise the price rather considerably, and there is no immediate prospect of any real improvement in the supply position of any castings. In consequence, the delivery of some of these items may get worse, as this is a matter beyond the control of the laboratory suppliers.

Where possible, steps are, of course, being taken to revert to non-ferrous castings, and to the use of aluminium sheet in place of steel sheet. It is not certain, however, how well the laboratories will tolerate the necessary increase in price, if much of the apparatus is converted to aluminium from steel sheet. The far-sighted will, no doubt, be willing to pay more. There are objections to the use of copper laboratory apparatus, which after six months in the average laboratory is prone to disintegrate, whereas an aluminium article can remain in good condition.

Most of the difficulties affecting the production of laboratory apparatus in general have had their influence on the production of sheet metal appliances—ovens, thermostat baths and water baths, and so on.

The story of production difficulties overcome applies especially to the production of laboratory porcelain ware. Here again the position which had been very bad indeed has been tackled energetically by the manufacturers and in several quarters new plant is now going into production. It is virtually certain that by the end of this year the supply of all small laboratory porcelain will be very good indeed, and deficiencies of larger sizes should be made good quite quickly after that. The transformation here is, in fact, one of the most encouraging parts of the whole picture.

Other items contributing to the general improvement are rubber tubing and bungs, now being produced adequately in rubber of pre-war quality, and filter paper, of which requirements are generally fulfilled with no delay.

PHOTO-ELECTRIC ABSORPTIOMETER

A ROBUST, compact and highly sensitive absorptiometer has been developed by R. S. Alldridge, Ltd. The instrument is a departure from established methods both as regards external design and circuit function, and is stated to work to ± 0.5 per cent accuracy. Under controlled conditions the standard deviation for a number of tests was found to be of the order of 0.4 per cent.

The application of such an instrument to routine photometry will be of interest to many industries and sciences where such tests are of paramount importance. Dyestuffs, textiles, food manufacture, sugar and oil refining, medical and scientific research are a few of the potential fields of application.

The instrument is entirely self-contained in a cabinet of modern design, the size being 15 in. by 10 in. by 9 in. and the weght under 30 lb. It is marketed by Laboratory Suppliers, Ltd., Ealing, and is available for 200/250 volts A.C.

The optical system is removable and can be replaced by a similar unit permitting additional measurement processes, such as fluorimetry and nephelometry

U.S. Leak Detector

New Halogen Vapour Method

A NEW American development in production testing of hermetically sealed units such as are contained in refrigerators, deep freezers and air conditioners, in which halogen compound is the refrigerant, has been announced by the special products division of the General Electric Company, U.S.A.

The portable detector and control unit in use

By means of a new portable detector unit, leaks in ordinary joints or seams can be located within a few seconds and the instrument can be used with equal effect in service testing in the field and assembly use. The actual detector, a hand-held probe with a pistol grip, has a metal nozzle with a plastic tip and weighs only 3 lb. The control unit weighs 15 lb.

Construction of Unit

The instrument contains a sensitive element which is responsive to halogens in the air, and a motor-driven blower which circulates the air through the element An 8-ft. cable lead connects the detector unit to the control unit which is portable and contains the power supply, amplifier, indicating instrument, necessary controls and a carrying strap. A 25-ft. lead is supplied to connect the control unit to the power supply.

To operate, the control unit is connected to any commercial 115-volt, 60-cycle power supply and voltage should be regulated to within plus or minus 1 volt. After the power switch is turned on, balance is obtained by adjusting the balance knob until the milliammeter reads zero. The range is then set on H, the highest sensitivity.

If the unit to be tested does not already contain halogens or a halogen compound, a halogen is introduced as a tracer gas. The nozzle of the probe is then held about half an inch from the surface of the unit being tested, and is moved around at the rate of about half an inch per second. As the nozzle passes over a leak, halogen vapour is drawn in, and as this vapour reaches the sensitive element, the increase in current is indicated on the milliammeter. Provision is made on the control unit for the use of earphones or a loudspeaker to indicate leaks.

SPECTROGRAPHIC ANALYSIS

A SPECTROSCOPIC analytical method for determining the beryllium content of magnesium alloys, developed by the materials laboratory of the Army Air Forces, Wright Field, Ohio, is described in a report by the Office of Technical Services, Department of Commerce, Washington 25.

Since the beryllium spectrum is highly sensitive, it was postulated that spectrographic analysis might prove a satisfactory solution to the problem. Usually, standard samples analysed by accurate chemical procedures are used in metallurgical spectrographic analysis, but since chemical analyses are difficult, it was decided to use solution samples preparing the standards synthetically from available metals and chemicals. All standards were made by adding beryllium to a solution produced by dissolving a magnesium alloy of the type to be analysed in 1 : 1 concentrated hydrochloric acid and distilled water.

The analyses were attempted using the solution samples in a direct current arc and in a high voltage spark sources. It was found that the success of the method depended on careful preparation of the electrode surface and accurately controlled drying of the electrode after the solution was placed on he surface.

Controlled spectrographic spark source conditions and dark room conditions were also essential. Sixty-one magnesium alloy samples were analysed by the developed method for beryllium contents in the range of 0.001 to 0.1 per cent. Below 0.025 per cent the average deviation from the mean of repeated determinations was 4.6 per cent of the amount present.

RAPID ELECTRICAL HEATING

Laboratory and Commercial Uses of Infra-Red Radiation

by A. E. WILLIAMS, F.C.S.

RADIANT heat is the name given to energy which a body emits by virtue of its temperature, and the nature of the radiation depends on the temperature of the source. The radiation emitted by a source at a temperature of 500°C. is all in the infra-red region of the spectrum, while a source at a temperature of 2500°C. emits both infra-red and visible light.

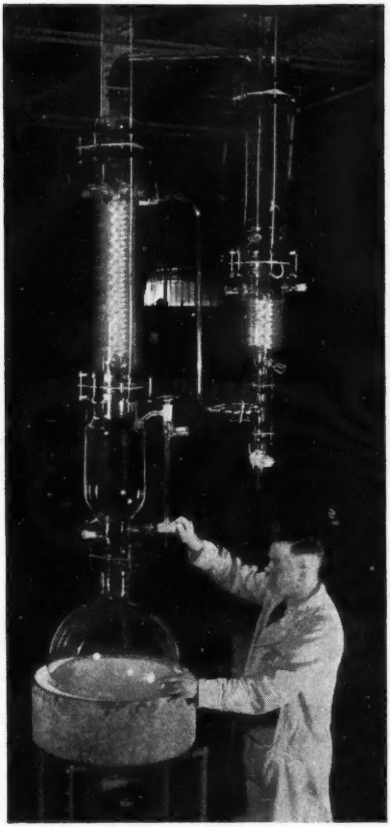
In practice, infra-red radiation is obtained either from specially constructed electric lamps or from special types of gas burners. Several British companies have for some years manufactured equipment for electrically creating infra-red rays; Mazda and Osram infra-red industrial lamps, for example, have long been prominent in this sphere.

Liquids and Powders

The popular form of infra-red tunnel which was widely used for the quick drying of paint on metal goods during the war, is not the ideal oven for the handling of chemicals, and for the latter purpose special equipment has been evolved. Briefly, infra-red radiation is applied to the heating of liquids contained in glassware for the purposes of evaporation or distillation. It is also successfully applied to the heating of powders in thin layers. In both these applications the source of radiation may be either infra-red lamps, or electric heating elements of a size to produce only the moderate temperature needed for infra-red radiation.

A liquid in a glass flask can be brought to boiling point by a bunsen burner; but it can be boiled more economically by infra-red radiation. The reason becomes obvious when we consider the nature of these two sources of heat. The bunsen burner has first to heat the glass and impart through this poor thermal conductor enough heat to raise the liquid on the other side to the required temperature. A proportion of the heat from the bunsen is lost by radiation in the atmosphere and dispersed on the outer surface of the glass and it eventually heats the liquid by conduction through the glass from the outside. Because glass is a poor thermal conductor it will be necessary to raise the temperature of the glass to a point much higher than that at which the liquid boils.

With infra-red, on the other hand, little or no heat is wasted; the rays do not heat the surrounding air and they have the property of penetrating the glass without appreciable heat being absorbed in the glass, the bulk of the heat being absorbed directly in the liquid where it is wanted. Heat-losses in these conditions are negligible; the glassware is no hotter than the liquid. Since the chemical industry insists



Glass still and condensers which illustrate the large scale of glassware equipment specially suited to infra-red applications

on using glassware for many of its operations, because of the high resistance to corrosion, the use of infra-red for heating the contents of the glassware is a big advance in that it overcomes the disadvantage of poor thermal conductivity.

Distillation, or evaporation, of materials in glassware by infra-red radiation does not necessarily mean that operations have to be on a very small scale, for glassware is now made to handle materials on a semi-commercial scale. A typical example of a glass still with its condenser, suitable for heating by infra-red methods, is seen in Fig. 1. This equipment (by Quickfit & Quartz, Ltd.) is suitable for handling practically all types of liquids. An average-sized glass condenser of this type has a coil 90 ft. long and is capable of condensing steam at the rate of 120 lb. of water per hour. The breaking pressure of the condensers is over 600 lb. p.s.i., so that they are capable of dealing with most factory processes. The capacity of the glass stills may be anything from 10 to about 50 gallons.

Radiation Disposition

In heating the stills by infra-red radiation, the source of radiation is disposed at suitable points around the still, the power used depending on the nature of the materials being handled in the still. The condensers can also be kept at a predetermined temperature by concentrating the radiation on them; for it is sometimes necessary to use warm condensers where the condensate is a solid at room temperature.

A typical infra-red oven is shown diagrammatically in Fig. 2. This employs Mazda infra-red lamps numbering anything from two upwards, depending on the capacity required of the oven. Such an oven is suitable for the rapid elimination of moisture from many types of powders, and for large outputs it may be constructed with open ends and a conveyor belt arranged to run through it. On the other hand, it may consist of a steel casing measuring only about 2 ft. square and containing only two infra-red lamps. In this small equipment powders are dried in a tray kept in the correct position relative to the lamps by means of guide rails.

Heat Wastage Obviated

The difference between this type of dryer and the ordinary convection apparatus is that the latter has first to heat the oven itself to the necessary temperature of drying before any elimination of moisture takes place, and then a big proportion of heat is expended in keeping the oven hot. The infra-red equipment, however, starts to eliminate moisture the moment it is switched on. It will in fact not heat the oven; it heats merely the material which is to be dried. The metalwork of the oven does not absorb the radiant energy to any great extent, whereas the material does.

In practice, it is found that the infra-red oven will dry almost any powder in about one-tenth the time taken by the usual form of convection dryer. With an average powder, starch for example, a layer of material

(Continued overleaf)

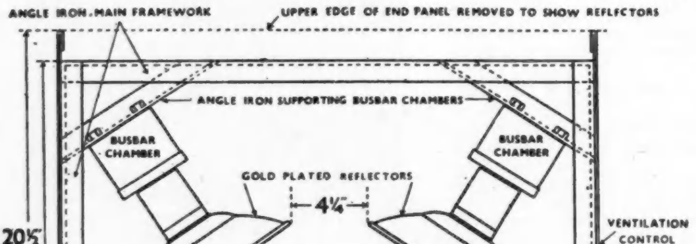


Fig. 2. Diagram of typical infra-red oven employing Mazda lamps—suitable for rapid elimination of moisture content of many powders

ELECTRICAL HEATING *(contd. from previous page)*

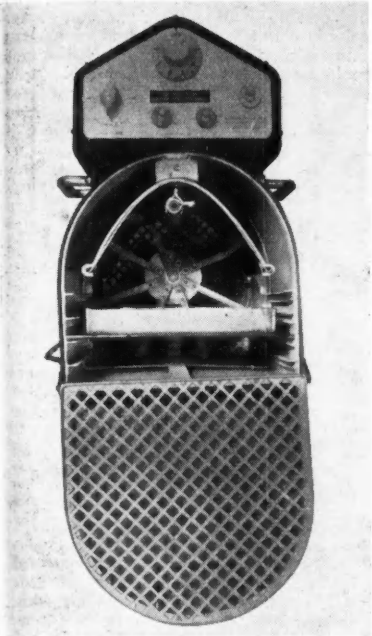


Fig. 3.

The Reavell infra-red drying unit, with the door opened, showing the interior arrangement of the oven

is dehydrated within 5 minutes by the infra-red oven; the convection dryer requires on an average about 50 minutes to do the same work.

Another advantage of the infra-red equipment apparatus is that the small electric type can be moved about the premises as required; a convenience not so readily conferred by the gas-fired infra-red apparatus.

Another type of electric infra-red dryer (Fig. 3), the Reavell infra-red apparatus, is made by Kestner Evaporator & Engineering Co., Ltd. This equipment comprises a drying and evaporating unit with an external electrical control box. In the main casing is mounted the generator at the focus of a reflector. A tray rack is fitted beneath so that a parallel beam of rays will fall upon the tray uniformly over its surface. The material to be dried or evaporated is placed in the tray. The movement of the air across the trays is caused by a motor-driven axial flow fan and can be warmed by a spirally-wound heating element, fitted in front of the fan.

A lamp is placed so that clear observation of the tray can be obtained when the apparatus is in operation. The control box panel is mounted above the dryer unit, and the control for the wavelength of the generator is graded in microns (1 micron = 10,000 Angtröm units).

In this equipment the following figures are based on an electrical supply pressure of 220 volts. At this voltage, the maximum power taken by the infra-red generator is 4.55 amps, with 3.75 amps for the air heater and 0.11 amps for the fan motor and lamp. The recommended power supply for this apparatus is 10 amps at 220/230 volts, A.C. supply.

XYLONITE EXTENSIONS

REVIEWING his company's extension programme at the 71st annual general meeting of the British Xylonite Co., Ltd., in London last week, Mr. C. F. Merriam, chairman, said that in 1947 substantial extensions had been undertaken, although as a whole they had not been completed.

The new buildings at Bexford were making good progress and the new synthetic camphor plant of B.X. Plastics was approaching completion, although it was not expected to be in full production until the autumn. Delayed delivery of heavy equipment had slowed progress at the Dundee works.

Two new factories had been started up, one at Christchurch in Hampshire for Scintillex, Ltd., a subsidiary of Halex, and one at Sheffield for Plastic Cutters, Ltd., a subsidiary of B.X. Plastics.

LIGHT METAL STATISTICS

MINISTRY of Supply statistics relating to light metals in February have been issued as follows (in long tons) :—

Virgin aluminium : Production 2292, imports 10,624. Secondary aluminium : Production 8469. Uses (aluminium scrap arisings) : 11,500, consumption 8735. Aluminium fabrication : 20,109. Magnesium fabrication : 238.

Stocks of tin metal held by the Ministry of Supply at February 1 amounted to 6083 long tons. After receiving new production (3012) and making deliveries to U.K. consumers and for export (2290), stocks at February 29 amounted to 6805 long tons. Consumers' stocks at 3008 long tons on February 1, were increased by Ministry deliveries during the month of 2176 long tons, but reduced during that period by consumption (2352) leaving stocks on hand at February 29 of 2832 long tons.

Water Insoluble Pigments

U.S. Bid to Solve a Textile Problem

THE use of pigmented compositions for printing textiles is already well known and has certain advantages over the use of dyes, but such compositions themselves have also some disadvantages including what is known in the trade as "hand" or an unpleasant stiff feel of the cloth in handling, said to be due primarily to bridging of the film from one yarn of fabric to the next, giving the impression that the fabric is woven from coarse thread, and "crocking" whereby the cloth gives up colour to another fabric or anything with which it comes in contact. The latter is often more serious with pigmented compositions than with dyes.

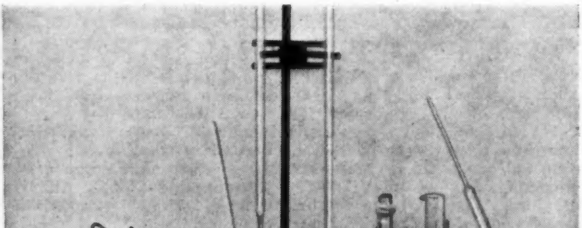
Such compositions should not only be immune from these defects but must also have good adhesion to fabric, sufficient strength, flexibility and extensibility to withstand crushing, crumpling, good resistance to washing, dry-cleaning, and ironing. Attempts made to use nitrocellulose as binder for textile marking compositions have not proved successful owing to gradual decomposition of the binder; cellulose ethers are also unsuitable for various reasons.

By means of an invention, recently the subject of a U.S. patents specification,* these difficulties are claimed to have been overcome by dispersing a water-insoluble pigment in a vessel containing water-insoluble cellulose ether and a soluble synthetic resin of the urea formaldehyde type. The latter is used to insolubilise the cellulose ether. Some additional plasticiser should be included. Three of the examples given are as follows (with percentage composition by weight) :—

Indanthrene blue	10
Ethyl cellulose	3.75
Urea resin soln.	2.50
Xylol	6.25
Pine oil	15
Solvesso	42.5
Water	20
Lithosol blue	10
Benzyl cellulose	4
Ethanol	3.2
Toluol	12.8
Beetle	5
Pine oil	15
Solvesso	30
Water	20
Monastral blue	10
Eth. cellulose	3.1
Urea res. soln.	5
Butanol	3
Pine oil	15
Solvesso	52.7
Water	20

* Textile printing compositions and printing or decorating of textiles therewith. Interchem. Corpn., New York, E.P. No. 4629/1948 Conv. date 13/7/39. 10 pp., 6 claims.

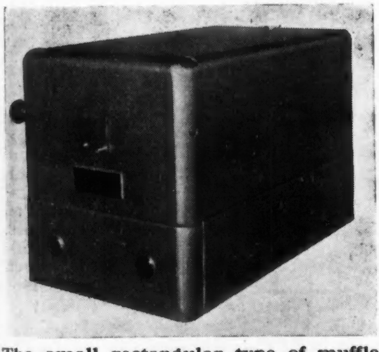
Chemical Production Index.—The interim index of chemical production for December, 1947, was 104 (1946 average = 100), according to the Board of Trade classified list of industrial production. This compares with 103 in December, 1947; 110 in November, 1947; and 114 for October, 1947.



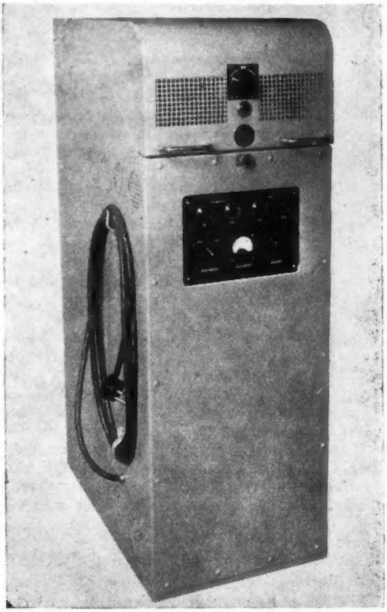
The Mullard universal measuring bridge forms a robust and convenient instrument for measuring the electrical conductivity of solutions, among its many other applications, such as direct measurement of resistance and capacity

Electrical Heating Devices

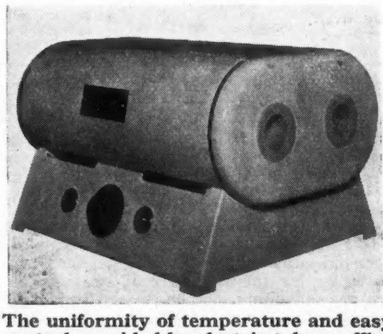
Another compact electrical heating device using the latest principles, a radio frequency welder for thermoplastic sheet materials (Radio Heaters, Ltd.)



The small rectangular type of muffle, providing temperatures up to 100° C. is a particularly convenient means of carrying out such laboratory work as heat treatment of small samples, burning off precipitates and incinerations (Wild-Barfield Electric Furnaces, Ltd.)



One of the latest additions to the range of electronic instruments by B.T.H., Ltd., the 1 kw dielectric heater



The uniformity of temperature and easy control provided by electric tube muffles make them particularly useful for critical point determinations and kindred uses. This is the twin tube model by Wild-Barfield Electric Furnaces, Ltd.

New Scientific Equipment

by I. C. P. SMITH, B.Sc., F.R.I.C., F.S.G.T.

OF the new articles now becoming generally available to chemists this year the most important is probably the glass heating mantle for flasks. We have in this country in the past enviously noted announcements in American journals for such articles, and now at least two firms are producing mantles in this country—J. W. Towers and Co., Ltd., and Electrothermal Engineering, Ltd.

These flasks have many advantages in smooth, safe heating, particularly if the mantle has sufficient flexibility to follow closely the contour of the flask, and if, as in the present design, an earthed surround to the heater is provided. For the semi-scale sizes of flask they are invaluable, as anyone who has tried to obtain efficient heating in an air-bath, or has tried to support a 100-litre flask in an oil-bath can testify.

The heating circuits on the larger sizes of heating mantles are subdivided so that heat may be properly applied as the liquid level inside falls. Heating jackets for the upper half of the flasks are sometimes an advantage, particularly in carefully controlled fractionations, and are, it it understood, in preparation, as are heaters for beakers and funnels.

J. W. Towers is offering several other useful items, notably a magnetic stirrer, a vibratory shaker, and lablox support frames for building up complicated apparatus, and among other familiar items a new precision analytical balance, sensitive to .05 mg., a humidity-controlled cabinet, and a laboratory oven.

Polystyrene Weighing Bottles

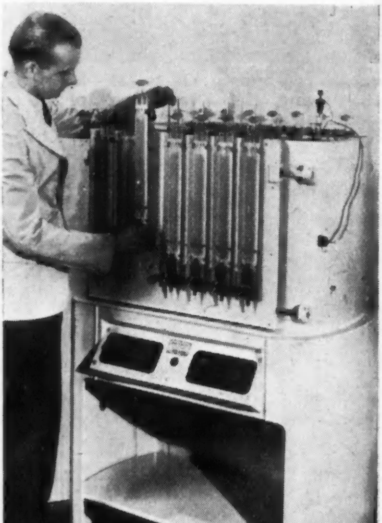
A new oven has been produced by Townson & Mercer, Ltd. Their most useful contribution this year, however, has been the polystyrene weighing bottle, which has been conceived as a substitute for the glass article, owing to supply difficulties. Yet it is by no means merely a stop gap, as the material has properties of resistance to moisture adsorption which are an advantage in this application. These bottles may also commend themselves to electrical experimentalists for the enclosure of small resistors or capacitors. The same firm also markets a 5-in. polythene funnel.

Telegraph Construction & Maintenance Co., Ltd., offers polythene pipe-lines.

In the main, however, it is remarkable how little the chemist himself makes use of the special properties of the new materials he has developed. Possibly there are few articles suitable for manufacture from plastic materials, but centrifuge tubes may be considered. Townson & Mercer, Ltd. also have a novel melting-point apparatus, which affords excellent observation of the sample, a modification of their popular glass-blowers' blowpipe to take oxygen, and, of course, an addition to their range of thermostat equipment.

Balances

Among balances, besides that by Towers, there are the Nivoc Aperiodic by W. J. George & Becker, and several additions and improvements in the Oertling range. The Nivoc balance has a capacity of 200 gm., a sensitivity of .01 mg. and is provided with externally-operated gram fractions and a projected scale. The added weights are 300 and 600 mg., the graticule covers



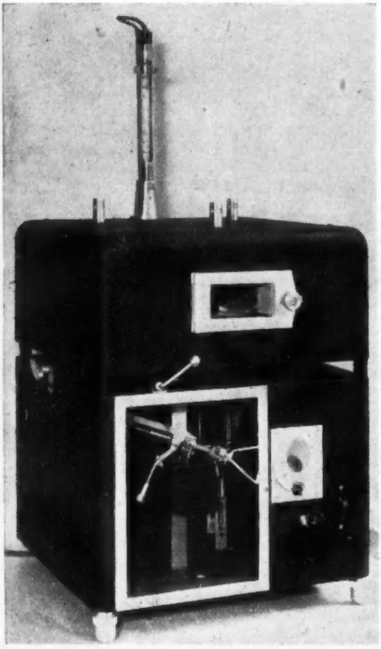
The new Warburg bath, now available from Baird & Tatlock (London), Ltd.

300 mg., and a special device is incorporated for zero setting and giving the fourth place in the reading.

The aperiodic projected scale balances by Oertling are also of the externally-operated gram fraction type. They have two dials, and operate a number of small weights, so that it is only necessary to read the dials and the projected scale to obtain the reading. This system is employed both on Balance No. 62 FM, capacity 100 gm., sensitivity 0.2 mg. per division, 0.1 mg. by estimation, and on the Semi-Micro Balance No. 141, capacity 30 gm., sensitivity 0.01 mg. per division. In these balances the graticule covers .01 gm., while in the former weights up to a total of 0.99 gm. may be added from outside the case, and in the latter 0.09 gm.

These two series of balances represent the two schools of practice in such apparatus. They involve, on the one hand, simplicity in added weights, with the need for a little mental addition when taking a weight, and on the other, a more elaborate mechanical device and larger number of small weights (and no mental effort required) which is preferable if left to the user.

Well designed portable *p*H meter (Model 23) by Electronic Instruments, Ltd.



Moisture content oven newly produced by Griffin & Tatlock, Ltd.

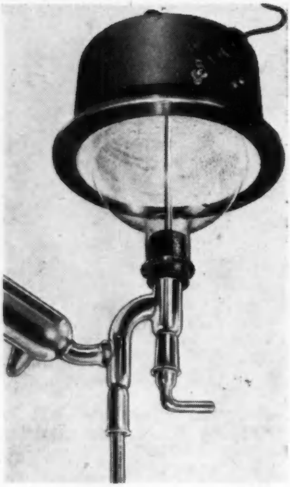
Centrifuges

A new series of laboratory centrifuges has recently been put on the market by Machine Shop Equipment, Ltd., which has made every effort to satisfy the chemist's requirements both in detail of design and robustness of construction. There is a "Major" with a maximum capacity of 2200 ml., speed of 1500 to 4500 r.p.m., and R.C.F. of 600 to 3400, according to the style of head employed. For this a number of different heads are available, all readily interchangeable, for combinations of tubes from 4 to 550 ml. down to 16 small tubes. All have swinging buckets, and angle heads to take different combinations of tubes from 10 ml. to 100 ml. size.

The centrifuge is constructed to stand on the floor on strong castors, and has a built-in autotransformer for speed control. This is an excellent arrangement as it is both economical and avoids the heat generated from rheostats. Electric tachometer and time switch are standard; there is also a super-speed attachment available for 18,000 r.p.m.

The MSE "Minor" centrifuge has a maximum capacity of 200 ml. and speed of

2300 to 4500 r.p.m. according to the type of head employed. This can also carry a number of combinations of tubes in either swinging-bucket or angle heads. Speed control is achieved by the use of a built-in ceramic embedded rheostat. The series is completed



Electrothermal heating mantle produced by Electrothermal Engineering, Ltd

with two small angle centrifuges of the totally-enclosed type, to take 8-15 ml. or 3-50 ml. plus 3-15 ml. tubes respectively. The firm also manufactures several forms of microtome and microtome knives.

The Warburg apparatus manufactured by Baird & Tatlock (London), Ltd., has now been in full production for over a year, and with its original well-considered design now incorporates many detailed improvements suggested by users.

Electrical Controls

The application of electrical controls continues to be one of the most fertile fields of process developments. This is well illustrated by the number of relays of recent production, of which Londex, Ltd., have contributed several of the contact and mercury types. A great deal of interest attaches to miniature contact relays and miniature mercury switch relays, the latter specially designed for use with thermocouples and similar highly sensitive circuits of the type commonly required in chemical processes.

The range of Londex timers is being continuously enlarged to keep pace with the continually increasing requirements in the field of process timing. As with relays, the tendency is for reduced size and synchronous process timers. The newer productions are especially suitable for the control of plastic moulding presses, radio frequency heating apparatus, heat treatment of metals, photographic processing and many other applications.

Photographic Aids

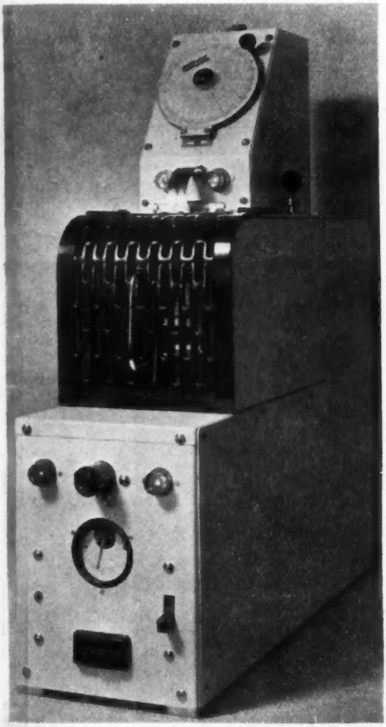
A process originally developed for recording the finishes of greyhound and horse races is now finding many industrial uses with the introduction of the Kodak quick finish panchromatic film and Kodak quick finish chemicals. Using the new method a wet positive print can be produced within one minute of exposing the negative. The film is supplied only in 35 mm. width, either in 100 ft. lengths unperforated or in 25 ft. lengths with positive perforation, and can stand unusually high processing temperatures.

Another Kodak development is the new kW Industrial spotlight, a special-purpose lamp of high intensity. It is a highly efficient 2000 watt light-source with a most effective cooling system. The lamp-house is in effect a double skin, the aperture between the inner and outer walls forming an efficient cooling arrangement (developed at the G.E.C. Research Laboratories). There is a constant circulation of air through the unit, which not only reduces lamp blackening and improves lamp life, but also enables the lamp-house to be handled without fear of burning the operator, even after the spotlight has been operating for a considerable time. The complete unit—lamp-house and stand, with cradle and cable, and lamp in position—weighs 37½ lb.

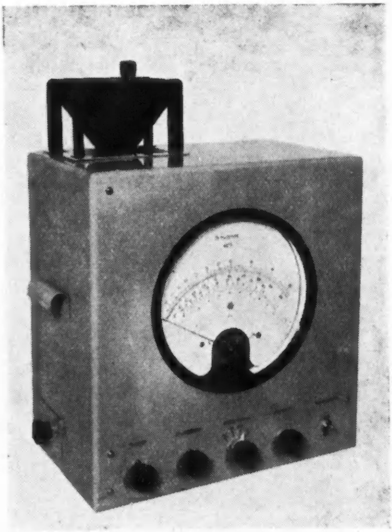
Cintel process timer for the accurate electrical control of processes of relatively short duration (Cinema-Television, Ltd)

MOISTURE CONTENT MEASUREMENT

OF the many methods available for determining moisture content, oven drying to constant weight is probably that most widely used. Such an oven is included in a list of new laboratory apparatus just received from Griffin & Tatlock, Ltd. It consists of an electrically-heated chamber (accommodating ten samples) with a precision analytical balance combined in one apparatus, enabling the moisture content of most materials to be ascertained in less than one hour. An interesting feature is the weighing of the samples without their removal from the oven. The time consuming operations ordinarily required—drying for a specified time, cooling in a dessicator, weighing on a balance, repeating the sequence until constant weight is attained and then calculating the results—are thus all eliminated.



The Radyne M2/A moisture tester enables a sample to be dried and continuously weighed at the same time, being equipped with a special spring balance, of which the pan is suspended from the balance arm between the electrode plates of radio-heated, built-in oven (Radio Heaters, Ltd.)



A stoutly constructed moisture meter of compact design—the Type E.90 model by the Mullard Wireless Service Co.

Drying Times

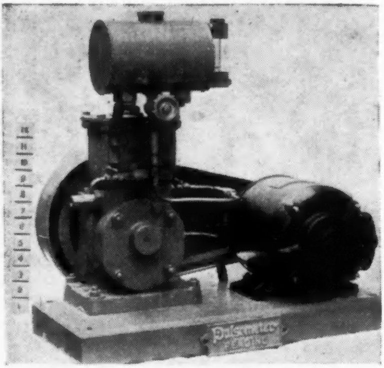
The system is designed for a 10-gram sample, on which the projection balance shows a scale reading directly in moisture content. Determination time depends upon the nature of the material (state of subdivision), and therefore the ease with which it loses moisture, and the temperature at which the oven is operated. This is controlled by a mercury-in-glass electrical contact thermometer. Temperatures of 110°, 130° or 150°C. are usually selected. Approximate typical drying times are as follows:—

15-20 Minutes: Pigments, salt, soap, moulding sands, shellac, and gums. 20-30 minutes: Rayon, clay, plastic moulding powders, linseed cake, and cotton seed, 30-60 minutes: Molasses, alfalfa, sugar beet, and zinc oxide.

HIGH VACUUM INSTALLATIONS

More British Equipment in a Widened Field

HIGH vacuum technique is not new. Its extraordinarily wide adoption, facilitating a host of procedures in the laboratory and the factory, however, is entirely a contemporary development, the importance of which has never been fully assessed.



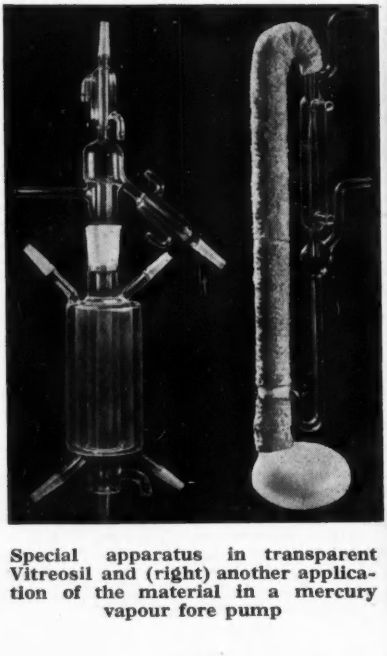
A typically compact example of the small-scale unit, the Pulsometer Geryk vacuum pump (4 S.T. 1) includes an oil seal but dispenses with oil immersion

The comparatively limited use of high vacuum principles before the war was associated with the fact that production of equipment in this country was not large; much of it was, in fact, imported. That situation has been completely changed by wartime and post-war development which provided a very representative range of British-made equipment adapted for a wide variety of uses.

Excluding consideration of the heavy industrial installations, it can be said that most designs currently being produced for laboratory use have the advantage of marked compactness and portability in respect of the evacuating mechanism. Generally accepted for the majority of purposes are rotary mechanical or diffusion pumps, of which the small, electrically operated motrice plants make little demand on laboratory space. There are, for example, a number of combined mobile units which can easily be accommodated on a 3 ft. sq. area of the bench or mounted on a very small trolley as a highly mobile aid wherever exhausting service is needed.

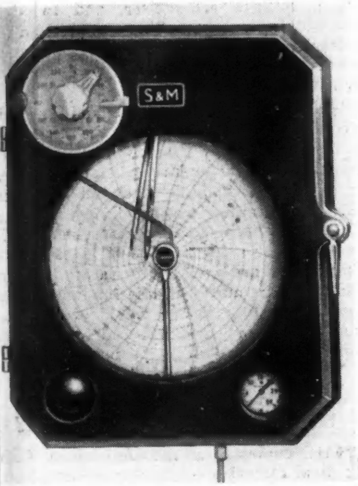
The mercury vapour principle has been exploited very successfully over a number of years for the production of high vacua in the laboratory. Not the least important of the merits of this type of equipment is that, being constructed of fused silica, it is unaffected by corrosive vapours. Some of the pumps which the Thermal Syndicate, Ltd., is producing enable very low pressures to be reached with comparatively simple equipment. Pressures of approximately 0.00002 mm. Hg. can readily be achieved where a good backing pump also operates at below 1 mm.

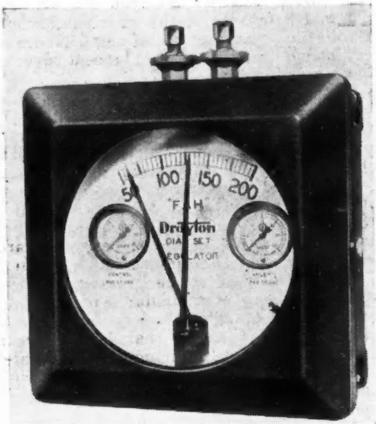
The Vitreosil mercury vapour fore pump has been developed for use with an ordinary water filter pump, and will produce a vacuum of less than 0.01 mm. Hg., which is more than adequate to operate a standard Vitreosil two-stage, or single-stage, pump. Thus a highly efficient and inexpensive vacuum system is within the means of practically every laboratory, and the customary mechanical backing pump is no longer necessary.



Special apparatus in transparent Vitreosil and (right) another application of the material in a mercury vapour fore pump

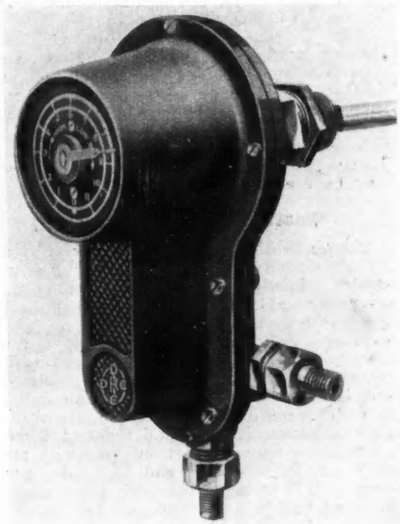
NEW CONTROL INSTRUMENTS





Above: Dial-set temperature regulator. Below: The "AM" temperature regulator (up to 1000°F.); both by the Drayton Regulator and Instrument Co., Ltd.

The "Fulscope" level buoy controller shown here is a new production of Short & Mason, Ltd., whose process time controller is seen above



Small Laboratory Tools

Interesting Exhibits at Physical Society Exhibition

AMONG exhibits featured by the Thermal Syndicate at the Physical Society's Exhibition, was a range of small laboratory equipment resulting from recent development work.

The newest exhibit was a high-intensity hydrogen discharge lamp, an interesting feature of which was the complete transparent Vitreosil envelope. Its use obviates the necessity of orientating the source to face a waxed-on quartz window, and enables the lamp to run at a higher temperature without having a water cooling system. It is now under test at the company's research laboratory, and the intensity and operating life are expected to be greater than any American lamp of a similar type. Because of the use of the complete fused quartz envelope, it is stated that lamps can be returned for reservicing approximately twelve times. As a source of ultra-violet radiation, its principal application is in spectroscopy.

Combustion Tubes

Another interesting exhibit was a range of combustion tubes, which were first produced about twelve months ago. They have now been extended in range and new shapes for special applications. Tubes of bore sizes $\frac{1}{4}$ in. to 2 in. are available and may be used at temperatures up to 1500°C.

The Thermal Syndicate also exhibited alumina pestles and mortars. They are produced in four sizes and are offered as substitutes for agate pieces now in short supply. Also on view were alumina, magnesia and mullite tubes and crucibles, and thimbles of beryllia, thoria, and zirconia. These special high temperature refractories may be used above 2000°C.

Glassblower's Hand Torch

Chance Brothers, Ltd., has now completed its development work on the "Flamemaster" hand torch which has resulted in a very adaptable article of particular interest to glassblowers. It is applicable to light welding, brazing, soldering, etc. It burns town gas, hydrogen, or bottled gases with compressed air or oxygen; the Flexiflame unit is standard and six further flame units, three for air and three for oxygen, are available to cover all sizes and types of flame up to a maximum gas consumption with air of 30 cu. ft. per hour, and 37 cu. ft. per hour with oxygen. A soldering bit is available, as well as twin flame fittings for the quick sealing of tubes.

The burner may be supplied with or without a built in economiser, and twin-bore, non-kinking rubber tubing completes a very attractive assembly. The makers are understood to be adapting the Flamemaster for bench mounting.

Glassblowers should also bear in mind the Neodex Goggles, employing the glass specially developed by Chance Brothers to protect the eyes, particularly when using oxy-gas or oxy-air gas flames. They cut out all the harmful radiations without losing the colour of the hot glass, and are extremely restful to wear over a long period of glass-blowing. The goggles are made up by Safety Products, Ltd., and are quite suitable for light brazing work, affording better sight of the work than the average goggles, and for observing work in infra-red drying tunnels.

U.S. APPARATUS SURVEY

THE chairman of the Division of Analytical and Microchemistry of the American Chemical Society, Mr. P. J. Elving, has appointed a committee to revise existing recommended standards for apparatus and recommend specifications for other items of quantitative-micro-semimicro, and ultra-micro apparatus.

When the committee has finished work on these recommendations attention will be given to the qualitative field, but it is pointed out that any recommendations will be made on the understanding that the specifications represent the most advanced thought at the present time and additional revisions will be made when necessary. Primary consideration will be given to glass apparatus.

Suggestions are invited by the chairman, Committee for the Standardisation of Microchemical Apparatus, c/o Hoffmann-La Roche, Inc., Nutley, N.J.

Technical Guidance

A 20-pp. booklet in full colour with a striking cover has recently been issued by Benn Brothers, Ltd., 154 Fleet Street, London. The booklet describes and illustrates THE CHEMICAL AGE and each of the Benn group of trade and technical journals, year books and directories. Copies are obtainable on demand from the circulation manager.

Laboratory Construction and Layout

Design and Equipment for the Analyst

by J. HASLAM, M.Sc., A.R.I.C. *

I HAVE thought, of recent years, that one of the reasons why analytical work is not, on occasion, as successful as it might be, is because we have paid very little attention to the initial construction of our laboratories and often, therefore, have to work under conditions which do not permit us to obtain results of the highest degree of accuracy.

There are, in general, three entirely different types of analytical laboratory in industry, and their requirements are quite different.

There is the "shift" laboratory where rapid tests are carried out actually on the plant, *e.g.*, in the plastics industry we may be engaged in the control of the *p*H of syrups and liquors, in a heavy industry, such as the alkali industry, in the rapid determination of alkali content of liquors by titration and in the colorimetric determination of metals such as iron. I usually find that such laboratories are hardly designed at all, but it has to be realised that there is an increasing tendency to use more intricate and expensive apparatus such as *p*H meters, Spekker absorptiometers and so on in this kind of laboratory, and if we pay insufficient attention to the housing and care of our apparatus we shall only have to pay for it in high cost of upkeep.

Then there is the so-called "day" laboratory. This exercises a rather detailed control on the raw materials, intermediates and finished products of a given industry. I do not propose to pay much attention to-day to either shift laboratory or day laboratory, but rather to concentrate on the third kind of analytical department found in industry, *i.e.*, the research analytical department.

In a general way this department will be responsible for the analytical work required by other departments, *i.e.*, there may be, within a given organisation, organic sections, inorganic sections, physico chemical sections, fabrication sections and so on. It will be responsible for all technical service analytical work and for queries arising from all kinds of works processes, and will be expected to be just as adaptable in devising new and rapid methods for use on a plant as in working out reference methods for use in connection with the most complicated research problems.

The first thing we should consider is the site of this laboratory, and in my view this should be well removed from the actual works. A research analytical department may have to exercise control over the manufacture of a chemical such as lead tetraethyl or bromine and no risk must be run that the results of the analytical determinations may not be correct because of air-borne contamination. It seems to me that the analyst must be encouraged to look ahead; perhaps his most difficult task, even if consulted about the design and layout of a new analytical laboratory, is to visualise the kind of analytical work he will be carrying out 10 or 15 years hence. In this connection I feel that the analytical laboratory of the future will need to be acquainted with tracer elements and their detection and will not be free from electronic devices.

Structure of the Department

Coming to our analytical department it will probably comprise some or all of the following sections:—

Office; filing and recording, including provision for standard samples; sampling department; main laboratory or laboratories; micro analytical laboratory; standardisation department; physical methods laboratory; toxic elements laboratory; physical testing laboratory (particularly when dealing with polymers and plastics); fuel analysis; lubricants analysis; gas analysis; metallurgical analysis; spectrographic analysis, emission and U.V.; infra-red analysis (possibly).

I think it a good plan to have a central corridor running through our analytical department with our main laboratories on one side and our smaller sections on the other.

I regard the office as the control room, and like to see therein a good analytical library, a blackboard, and, further, a good system of communication with all the sections in the department: I have seen buzzer systems used with good effect. Nevertheless, I think that I ought to warn all young analysts against being too wedded to the analytical office because it is very doubtful whether much emphasis should be placed on the desire to become an "arm chair" analyst.

I have worked in very large analytical laboratories, one of which was 60 yards long, and very small ones, one of which was hardly 10 ft. and, moving about industry, have seen a very heterogeneous collection, sometimes with the balance in the chief's office, and very often on the end of a bench. However, as a result of such

* (Contributed to Wednesday's symposium at the London School of Hygiene and Tropical Medicine, organised by the Royal Institute of Chemistry).

observations as I have made I feel that I do not like very large laboratories or very small ones. Large analytical laboratories, *e.g.*, employing in one laboratory as many as 40 persons, are usually very noisy and it is often inconvenient to site balance rooms in such large individual departments. They may appear to be very good "show" places, but they are not the best places in which to secure first-class analytical results.

I like to avoid analytical laboratories which are very small because I feel that the main analytical laboratory is often a training ground as well as a place for carrying out detailed analytical work.

Ideal Layout

I think that a very desirable kind of analytical laboratory is one of approximate dimensions 45 ft. by 25 ft. with accommodation for six analysts and provided with an adjoining balance room. In such a laboratory I would have three benches, each 12 ft. by 5 ft. and each accommodating two men, one on either side. I like movable cupboards, so that services can be readily repaired. I would make as much use as possible of the outer sides of the room to provide as many fixed pieces of apparatus for use of the various analysts.

The kind of apparatus set up will vary with the work done, but might, in a laboratory concerned with the analysis of plastics, include such items as: Glass blowing bench, drying ovens 180° and 100° C., Fischer titration apparatus, small furnace for ignition of precipitates, steam distillation apparatus, ammonia distillation apparatus, hot plates for saponification apparatus, potentiometric titration apparatus for use in the titration of halides, apparatus for re-distillation of distilled water, autoclave for use in O.H. determinations, vacuum drying oven, titration bench, Parr bomb (electro ignition), apparatus for continuous extraction with hot ether, macro carbon and hydrogen apparatus, Grote sulphur apparatus.

And now we come to a point to which insufficient attention is given in most analytical laboratories, that is, fume chambers. Again and again it was emphasised in wartime that the average analytical laboratory has altogether too little fume chamber and hot-plate accommodation, with the result that tests are often carried out in the open laboratory which should not be carried out there. In the laboratory I have described I would, as far as possible, utilise the whole of one long side for fume chambers and hot plate and steam baths. I would like the fume chambers to be tiled and clean with the usual services and, further, with really efficient draught systems. They can have tiled floors, glass sides with wire meshing and detachable panels to enable the services to be reached.

The roof of the analytical laboratory is a real problem. Far too often it consists of a mass of girders and badly protected ironwork, and, as a rule, this makes it extremely difficult to carry out determinations of trace metals so frequently required in industry. I am in favour of flat roofs. For the floor of a laboratory I prefer parquet wood blocks.

As regards the benches themselves, I know that the usual preference is for wood, *e.g.*, teak tops, but my own personal preference is quite definitely for a tile top because it is so easy to keep such a bench top perfectly clean.

I like all service taps, *e.g.*, vacuum, compressed air, and gas, to be near the analyst rather than at the far side of his bench, and, in common with most analysts of my acquaintance, prefer sinks to be big enough and to be at the ends of benches and, further, to be provided with both hot and cold water.

Among other desirable aspects of laboratory equipment and design which the speaker mentioned were ample window space, preferably from bench top to ceiling, generous fluorescent lighting, notwithstanding the rather higher cost, and a balance room providing stability and climatic conditions suitable for the more sensitive balances which were likely to be developed. He described the satisfactory heating of a balance room 10 ft. sq. by two tubular heaters in 4 ft. lengths consuming some 640 W per hour.

Layout and Fixtures

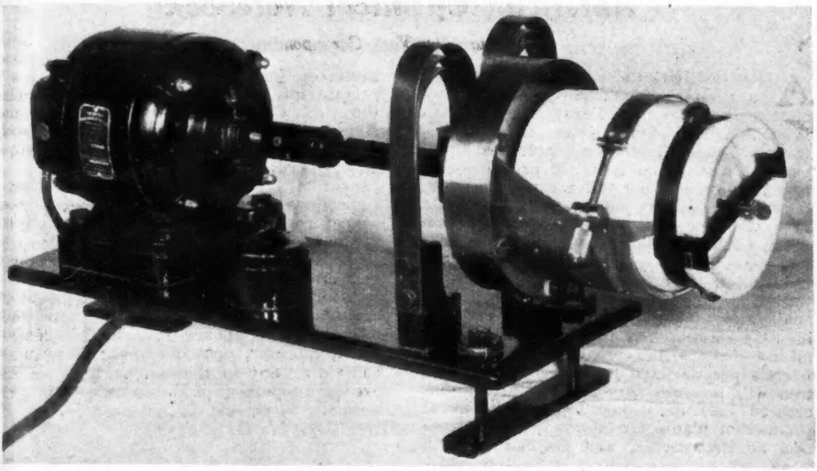
by C. L. PRIOR

Consideration of laboratory layout and fixtures was provided by Mr. C. L. Prior. The author distinguished the **basic types** of laboratory as two main groups: routine and research; the first comprised laboratories for teaching, industrial and medical purposes, and the second also contained industrial and medical types with the addition of university laboratories. These sub-divisions were capable of still further classification into many different types.

In choosing the site or building for a laboratory it was a wise plan to utilise a carefully prepared programme of development, starting with a sequence of the scientific processes to be undertaken, and planning each laboratory according to its special work.

The basic requirements must be determined by the scientist himself. The actual

(*Continued overleaf*)



A useful and self-contained item of laboratory equipment, the latest form of small vibratory ball mill by Griffin & Tatlock

planning in connection with the laboratories could be carried out by a specialist or consultant, although, even then, the scientist or architect might have sufficient experience to carry out the work. The designing of the building itself was usually the responsibility of the architect and the selection of the latter called for great care, in view of the specialised experience he must bring to bear. The choice of consultants or specialists was best left to the scientist or chemist.

Selection of Apparatus

Special points requiring consideration were the air-conditioning system, ventilation and fume removal, all of which were interconnected.

Materials and methods of drainage, lighting, vibration and accoustics also demanded close attention and the complete scientific layout should be flexible enough to meet changing requirements.

The selection of laboratory furnishings, said Mr. Prior, involved a number of considerations including the relative merits and demerits of steel, wood, fixed or built-in fittings and movable units. The chief difficulties were usually unsuitable floor construction, room layout, poor lighting, cramped head room and the inadequacy of incoming services and wastes.

Chemical Stoneware

Chemical-grade containers made from vitreous, acid-proof and highly durable stoneware, produced as a practical alternative to the conventional wood lead-lined boxes for stationary cells, have been marketed by The Chloride Electrical Storage Co., Ltd., Exide Works, near Manchester.

Cells assembled in these containers have an attractive appearance, which is considerably enhanced by having them mounted on combined insulator and pedestal supports, made from the same material, which eliminate the need for wood stillage and provide a high degree of insulation. Cleaning is easier, overall dimensions are reduced, and risk of leaks and electrical complications are eliminated. It is emphasised that cells in this type of container will be available for the export market. Eventual production of the widest possible range of sizes—for all capacities varying from 400 to 1000 a.h. is visualised.

Coal or Oil?—Rising cost of fuel oil is disturbing Scottish manufacturers and encouraging a tendency to revert to coal. Steel manufacturers have achieved very considerable success with oil-firing and the higher efficiency of oil is likely to encourage retention of the system despite the higher cost. In certain other industries, such as textiles, the greater cleanliness of oil fuel is an important factor.

American Chemical Notebook

From Our New York Correspondent

ADDRESSING the annual convention of the Western Petroleum Refiners' Association in Galveston, Texas, recently, Dr. R. W. Krebs, of the Esso Laboratories, Baton Rouge, Louisiana, predicted that gasoline made from coal will probably cost 10 c. to 15 c. more per gallon than at present, but that the supply will be sufficient to last over 1000 years. Dr. Krebs said the anticipated world petroleum demands of the next ten years make it imperative for the oil industry to investigate the possibilities of producing oil from natural gas, coal, shale and tar sands. He added that the industry expects that the world demand for oil by 1949 will approximate 10 million barrels per day and that foreign consumption will increase very rapidly through increased mechanisation. Two synthetic oil production plants are now under construction at Brownsville, and Garden City in Texas.

* * *

Vulcanisation of rubber by electronic curing, which has substantially reduced the time formerly required for this operation, and which has been carried on for several years on an experimental basis, has been adopted as standard production procedure by the B. F. Goodrich Company for certain types of extruded products. Such articles as tubing, strip and channel stock and rubber thread are being given the rapid electronic cure. Electronic curing eliminates considerable handling during manufacture, and confers quality advantages. Electronic energy waves, travelling at up to 186,000 miles a second, by agitating molecules in the rubber can instantaneously generate a temperature of about 300°C. In some products the actual curing time is reduced from 1½ hours to two minutes.

* * *

At the request of the United States Atomic Energy Commission, the U.S. Department of the Interior has approved an order withdrawing from entry and reserving for the use of the Commission approximately 40 sq. miles of public lands in south-western Colorado. During the summer, the Commission plans to diamond drill the reserved area in search of uranium deposits. Any lands found to contain no uranium will be released from the withdrawal order and will again be open for entry. It is expected that lands found to contain uranium will become available for development and mining by private interests under arrangements with the U.S. Government. Shortly after the American announcement was made, Canada's atomic energy board announced a general order relaxing regulations on information about radioactive minerals. Henceforth, prospectors and other parties concerned will be allowed to communicate information on analyses of ore samples and those receiving analyses or assay reports will be permitted to release information on the location or probable extent of deposits of uranium or thorium, subject to provisions of any specific board order. The general order, however, does not apply to uranium containing any of the isotope U233 or any greater proportion of the isotope U235 than normally is present in nature.

* * *

U.S. officials, studying replies to a chemical requirements questionnaire submitted to the 16 Western European nations which will participate in the European Recovery Programme—now re-named Economic Co-operation Administration—state that America will ship chemicals and drugs to the value of $200 million to these nations during the 1949 financial year, or about $30 million short of the record total which was exported to the same nations during 1947. The U.K., France, Italy, Sweden, Holland, Belgium and Denmark will account for some 95 per cent of United States chemicals and drug exports under the recovery programme in twelve months commencing next July. The U.K. has estimated that it will need $60 million in chemicals and drugs from the United States in the fiscal year 1949. U.S. Commerce and State Department officials have trimmed this to about $54 million, which is about the same amount that the U.K. imported from the United States in the calendar year 1947. The French estimate of $79 million of chemicals and drugs from the United States in the next fiscal year, has been cut to $24 million, which is well below the total imported by France from the U.S. in 1947. Italy, whose demands for U.S. chemicals and drugs are expected to rank along with Britain and France, has not yet furnished the State Department with detailed requirements. Eire has asked for $6 million worth of American chemicals and drugs for 1949.

RAPID STEEL TESTING DEVICE

New U.S. Spectrometer Reduces Production Costs

A NEW device, the Baird Associates-Dow direct reading spectrometer, which is said to cut down from 20 minutes to five minutes the time usually taken in analysis of the elements in a particular batch of steel is now in use in the American steel industry. The developers of the instrument, Baird Associates, of Cambridge, Mass., and Dow Chemical Company, Midland, Michigan, claim that the invention, by cutting the testing time, will substantially increase output and reduce labour costs.

The new spectrometer utilises electron tubes to make a direct reading of the spectral content without resorting to photography. The instrument separates the characteristic spectrum line of as many as eight elements. Light-sensitive tubes measure the strength of each spectrum line to determine the relative amounts of elements making up the batch. The results are measurable on meters.

Recording may be made of the exact amounts present of manganese, silicon, chromium, nickel, molybdenum, copper, vanadium, aluminium or other metals employed by the manufacturer. The instrument will also record the presence of residual elements which can "poison" the metal batch.

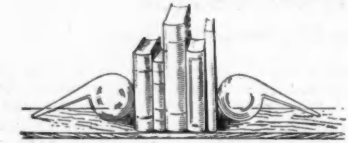
Aluminium and other metals can be tested in the same way.

Britain Welcomes Swedish Students

UNDER the Vacation Work Scheme for students of the Imperial College of Science and Technology, a party of Swedish chemical engineering students from the Royal Technical Institute, Stockholm, recently toured British chemical and allied industrial establishments.

An extensive 17-day programme, which began with a housewarming at Imperial College on April 5, and ended with a supper organised by the Imperial College Vacation Works Committee on April 21, has included visits to the Slough works of Imperial Chemical Industries' Paint Division, Boots Pure Drug Co., Ltd., at Nottingham, Beckton Gasworks, and Lever Bros. & Unilever, Ltd., Port Sunlight and Bromborough. This week, the Swedish students wound up their tour with trips to May & Baker, Ltd., Dagenham, the "Shell" Refining & Marketing Co., Ltd., Shell Haven, and Arthur Guinness & Son's brewery, Park Royal, London, N.W.10.

A group of Stockholm Technical High School students during their visit to I.C.I. Paints Division at Slough. Mr. L. W. McLaughlin answers questions from one of the groups



A CHEMIST'S BOOKSHELF

Fundamentals in Chemical Process Calculations. By Otto L. Kowalke. The Macmillan Company, New York. 1947. Pp.X + 158. 14s. net.

The textbook, which is intended for chemical engineering students, is based on the author's experience gained in more than two decades of teaching as Professor of Chemical Engineering, University of Wisconsin. The book will help students bridge the gap between the conditions under which some fundamental principles were first learned, and the conditions under which they are applied. It follows in many respects a new course and method of instruction and its scope of information is best given in the list of the twelve chapters: Temperature Scales; Density and Specific Gravity; Pressure and its Measurement; Molal Units; Methods of Expressing Compositions of Mixtures and Solutions; Pressure-Volume-Temperature Relations for Gases; Partial Pressures of Gases and Vapours; Material Accounts; Salts Crystallised from Water Solutions; Silicates and Slags; Combustion Calculations for Fuels; and Heat Losses in Products of Combustion. Each chapter introduces a number of circumstances of common occurrence problems which will increase an interest in, and a capacity for solving, engineering problems. Included are many charts, figures, and tables and an index. It will be welcomed as a glossary of its specified field by students as well as by teachers.

The Properties of Tin Alloys (except bronze). By L. T. Greenfield and P. G. Forrester. 44 pp.

The book, published by the Tin Research Institute, Fraser Road, Greenford, Middlesex, contains in a concise and comprehensive form the available data concerning the properties of tin alloys other than bronzes. The information collected and classified is based on published literature, represented by 98 references, and on hitherto unpublished work carried out for the Institute. In addition the authors have carried out some hardness and tensile tests on the more important alloy systems in order to clarify certain apparent anomalies and to fill in the more significant gaps in the available information. Besides hardness and tensile properties, the publication deals with impact strength, shear strength, comprehensive strength and elastic modulus of certain alloys. Nomenclature, classification of alloys, standard conditions and the effect of deviations therefrom are summarised. There are more than 60 tables and numerous diagrams.

Breathing in Irrespirable Atmospheres. By Robert H. Davis. London: The St. Catherine Press Ltd. Pp.XI + 386. Price, 25s. Net.

The author, managing director of Siebe, Gorman and Co., Ltd., is a very competent authority for an account of all that appertains to overcoming problems of breathing under conditions harmful or lethal, having the advantages of a lifetime's study and practical experience of design and production of apparatus for breathing under abnormal conditions.

The present book is dedicated: "To the Officers and Men of the Royal Navy, the Army and the Royal Air Force, the Mine Rescue Brigades, the Fire Services, and the many others, who, in war and in peace, have used the appliances described herein." Within its 11 chapters are an historical section which brings to light a number of surprising facts, and treatments of the Physiology of Respiration; Breathing at High Altitudes—including a short history of aeronautical achievements; Resuscitation; the Evolution of Breathing Appliances, leading up to a description of the latest apparatus; and an account of mines rescue and recovery work. Breathing apparatus for chemical works is described in detail. A foreword is contributed by the eminent physiologist Professor Sir Leonard E. Hill, who for over forty years has been associated with the author in the same problems and who is a co-author of the chapter on the physiology of respiration. The book is profusely illustrated and is completed by many tables, charts, diagrams and a comprehensive index. Sir Robert Davis' work may be warmly recommended not only to those whose vocation calls for work in irrespirable atmospheres, but also to the general reader. It recalls the problems which were posed by war, contains devices for the protection of workers from various risks in the course of their employment, and deals expertly with similar related matters.

Japanese Aluminium

Wartime Search for Bauxite Substitutes

HOW Japan, a substantial importer and consumer of aluminium before 1938, developed into the world's fourth largest producer during World War II is revealed in a report released by the U.S. Bureau of Mines.

Japanese production in 1943 the peak year for both the Nipponese Empire and the U.S.A.—was 150,000 tons of aluminium, compared with 920,000 tons in the U.S.A. Cheap and abundant electric power and plenty of shipping to bring in bauxite from as far away as Greece, and from South-east Asia and the Pacific Islands until Japan lost control of the sea, made possible that very rapidly expanding aluminium industry. In the five years before Pearl Harbour, 80 per cent of production went for military uses, which subsequently until the surrender, received the entire output, the report reveals.

From Many Sources

Production, technique, equipment, and even operating experience were obtained directly from the United States, Germany, and to some extent from Norway and Sweden. Not until the air and sea blockade made it necessary to turn for raw material from bauxite to aluminium shale from Manchuria and alunite from Korea, and finally to domestic clays, did difficulties begin to multiply. The problem of producing aluminium from clays had not been solved when the country's military collapse brought the industry to a standstill.

The report says that production methods varied little from those used in America. The history of the Japanese aluminium industry is outlined, and raw materials, aluminium processes and aluminium reduction, costs and economics, and current position and outlook are discussed. The report contained descriptions of 13 plants and the text is supplemented by tables, maps, charts and diagrams. A bibliography is appended.

U.S. Sulphur Production

Production of native sulphur in the U.S.A., during February this year, amounted to 388,332 long tons, which almost equalled the January output and was 30 per cent greater than in the corresponding period in 1947. Mine shipments in February totalled 334,142 long tons and sales were estimated at 413,292 long tons.

Oil Refining in Germany

2 Million Tons to be Processed Annually

THE Control Authorities in the British and U.S. zones of Germany have agreed that sufficient German refining capacity to process 2 million tons of imported crude oil a year should be operated. This amount is considered sufficient to meet the needs of finished petroleum products in the bizone and to provide approximately 175,000 tons of lubricants, asphalt and waxes yearly for export. It is expected to save $25 millions (£6,250,000) of imports per annum.

Rehabilitation of German refining capacity will require considerable amounts of material, which, it is stated, are to be provided from indigenous sources only.

BELGIAN UNDERGROUND GASIFICATION

SUCCESS is stated to have attended the experiments, made over a number of years, by M. Pierre Demart, a Belgian mining engineer, to establish the underground gasification of coal on a commercial scale in western Europe. Operations utilising his methods are reported to have commenced two months ago in a coal mine at Bois de la Dame, near Liége, by Demart's own company, in which the Belgian Government is a shareholder. The gas produced is used, after purification, to drive turbines for the generation of electricity, the cost of which is said to be 25 per cent of the present price. The process permits substantial economy of labour.

FERTILISER TRADING CUT

PRESENT difficulties facing fertiliser producers were outlined by Mr. Archibald Dryburgh when he presided at the annual general meeting of Central Farmers, Ltd., fertiliser manufacturers, Methil, Fife. The company showed a turnover decreased by £10,650 and a net profit for the year of £9468. This company has had very considerable plans on hand for several years for the expansion of the chemical fertiliser industry in Fife where it operates as an agricultural co-operative. These developments were being hampered, Mr. Dryburgh said, by the obligation to confine themselves within certain statutory regulations. The firm paid a bonus of 10s. per ton on fertilisers and feeding stuffs, and an extra bonus of 5s. per ton on potassic mineral phosphate.

Parliamentary Topics

Zinc Oxide Exports.—Sir J. Mellor asked why E. C. Rich & Sons had been refused a licence to export 25 tons of best quality zinc oxide to Egypt. The chemical could not be disposed of in the United Kingdom owing to consumers being overstocked. Mr. J. W. Belcher: The quota allotted to this manufacturer for export has been exhausted and it is not possible therefore to issue a licence at present. The supply position of zinc oxide is a matter for the Minister of Supply, who has the matter under review.

Witherite Deliveries.—There is no statutory control of witherite, although the two producers of this material normally consult the Board of Trade about the distribution of their output. Deliveries of witherite to consumers will probably be less in the current quarter than in recent months, but output is being maintained and the opportunity is being taken to build up stocks.—Mr. J. Belcher.

More Fertilisers.—In reply to a number of questions alleging recent shortages of fertilisers in various parts of the United Kingdom, Mr. T. Williams said: "Owing to the early season, farmers in some parts of the country are experiencing a shortage of fertilisers, particularly compounds containing potash, but up to the end of March of this year considerably more fertilisers of all kinds had been distributed than for the same period last year." The Minister later provided the following table giving details of actual supplies to the end of March this year as compared with a similar period last year:—

Variety	Estimated supplies available July 1, 1947 to March 31, 1948	Actual supplies available July 1, 1946, to March 31, 1947
Nitrogen ...	152,000 tons N.	133,000 tons N.
Phosphates	296,000 tons P_2O_5	272,000 tons P_2O_5
Potash ...	145,000 tons K_2O	90,000 tons K_2O
Compounds	1,102,000 tons	840,000 tons

Petrol Dyeing.—No dollar expenditure will be involved in dyeing commercial petrol as recommended in the Russell Vick Report. It would not be in the public interest to disclose at what stage in the distribution of petrol the dye will be inserted, or to indicate the steps which are being taken to investigate the possible manufacture and sale of dye neutralisers.—Mr. A. Robens.

Osseine and Gelatine.—Imports from Belgium of osseine and edible gelatine during the three months ended February, 1948, amounted to 236 tons and 280 tons, respectively. Technical gelatine is not separately distinguished, but imports of technical gelatine together with glue and size, during the same period, amounted to 65 tons.—Mr. H. Wilson.

Official Notices

Ground Sulphur Price.—The Board of Trade has made an order, effective from April 19, increasing the maximum prices of ground sulphur by 12s. 6d. per ton. Copies of the order, the Ground Sulphur (Prices) (Amendment) Order 1948 (S.I. 1948 No. 751) are obtainable from HMSO, (1d.).

Bichromates Price Stabilised.—The Control of Bichromates (Revocation) Order, 1948, made by the Board of Trade, which comes into operation on April 19, revokes the Control of Bichromates (No. 1) Order, 1941, as amended by the Control of Bichromates (No. 2) Order, 1942. The producers have agreed with the Board of Trade not to increase the prices at present being charged without prior consultation and agreement with the Board of Trade; these prices will be maintained at least until August 31.

Photographic Film.—To take account of the increased rate of Purchase Tax on photographic film announced in the Budget, the Board of Trade, in consultation with the Central Price Regulation Committee, has amended the Photographic Film (Maximum Prices) Order 1946 (S.R. & O. 1946 No. 1915) by fixing increased maximum prices which include Purchase Tax. These are set out in the Photographic Film (Maximum Prices) Order 1948 (S.I. 1948 No. 732) which took effect on April 14. (HMSO, 1d.)

Inadequate Sodium Supplies.—Asked by Mr. Scott-Elliot whether the President of the Board of Trade would consider supplying the excessive demand from home and overseas markets for sodium compounds by employing firms other than I.C.I., Ltd., in their manufacture, Mr. Belcher said: All measures possible were being taken to improve the supply, including the support of suitable projects put forward by firms other than the one mentioned.

German Factories (Dismantling).—There remain 223 German factories still to be dismantled in the British zone under the level of industry plan, and it is not the Government's intention to alter its dismantling obligations unilaterally because of a change of circumstances.—Mr. E. Bevin.

Opencast Coal (Cost).—Asked why the average cost per ton of opencast coal is seven times the selling price per ton of quarried limestone, despite the fact that methods of obtaining both are largely similar, Mr. H. T. Gaitskell said that about ten times the volume of earth had first to be removed in the case of coal; limestone seams were usually nearly 20 times as thick as coal seams, and practically no restoration costs were incurred in limestone quarrying.

PERSONAL

Mr. G. P. Belsham, 48-year-old works manager of Brookhirst Switchgear, Ltd., Chester, has been appointed a director of the company.

Dr. J. J. P. Staudinger has been appointed to the board of British Resin Products, Ltd., and will occupy the position of director of research.

Newly appointed representative in North-west England and North Wales, of Hadfields, Ltd. (from May 1): Mr. W. H. Salmon.

Mr. Ambrose Callighan, general secretary of the National Union of Blast Furnacemen, has announced his intention of resigning from the position on medical advice.

Mr. William Sharp, manager of the Sandhills works of William Gibson & Sons, Liverpool paint manufacturers, has celebrated his diamond jubilee with the firm, which he joined as an office boy on April 14, 1888, when he was 13.

Prof. Sir John Cockroft, director of the atomic energy research and development establishment at Harwell, has been awarded the James Alfred Ewing Medal for 1947 by the Institution of Civil Engineers for contributions to the science of engineering in the field of research.

Mr. J. L. P. Roche-Victoria, who is promoting Heavy Chemicals, Ltd., which is being incorporated as a joint-stock company for the manufacture of electrolytic caustic soda and a number of other products in great request at Tuticorin, South India, will visit Britain in June. He hopes to contact manufacturers who may be interested in these and ancilliary products.

Sir Frederick Bain, M.C., has been elected for a second year of office as president of the FBI. Sir Frederick Bain is a deputy-chairman of I.C.I., Ltd., and a vice-president of the British Employers' Confederation. From 1941 to 1944 he was chairman of the Chemical Control Board at the Ministry of Supply, and from 1942 to 1944 also chairman of the Chemical Planning Committee, Ministry of Production.

Mr. Arthur H. Martin has been appointed president and managing director of Canada's Standard Chemical Co., Ltd., in succession to Mr. K. S. Maclachlan, who has retired from active business. Mr. Martin joined the sales department of the Canadian Ammonia Company of Toronto in 1920, and was later transferred to the parent organisation, the Michigan Ammonia Works of Detroit, where he became sales manager.

Mr. H. R. Odling, financial director of Lever Bros. (Port Sunlight), Ltd., since 1944, has been appointed assistant chief accountant of Lever Bros. & Unilever, Ltd., London, and will be leaving Port Sunlight on June 30. He will be succeeded by Mr. Arthur Lewis, chief accountant, who has been at Port Sunlight nearly 35 years.

Dr. E. W. R. Steacie, director of the Canadian National Research Council's Division of Chemistry, and an international authority on some aspects of atomic research, has been elected a Fellow of the Royal Society. Dr. Steacie is noted for his work in the field of physical chemistry relating to reaction of atoms and free radicals with organic substances. He has written two books on the subject. During the war he served as deputy director of the Canadian atomic energy project.

The Textile Institute announces that the following are among those who have been elected to the Associateship: Mr. Frank Brentnall Hill, Ockbrook, Derbys., assistant superintendent, British Celanese, Ltd., joint inventor of the Fortinese and Fortisan processes; Mr. William Lowe, technical representative of Ciba, Ltd., in Hong Kong; Mr. Thomas Hill, Leek, Staffs., works manager and textile dye chemist at Joshua Wardle, Ltd., Leek.

Tar Distillers' Officers

At the recent annual general meeting of the Association of Tar Distillers the following officers were elected for the ensuing year: President, Mr. W. A. Walmsley (Thomas Ness, Ltd.); vice-president, Mr. C. Lord (Lancashire Tar Distillers, Ltd.); hon. treas., Capt. C. W. Harriss (Burt, Boulton & Haywood, Ltd.); and hon. aud., Mr. E. Hardman (E. Hardman Son & Co., Ltd.).

CHEMICAL SOCIETY GRANTS

Grants for chemical research are to be made by the Council of the Chemical Society in June next. Forms of application, which may be obtained from the general secretary, should be submitted on or before May 10. Prior consideration will be given to Fellows of the Society.

The funds have been made available partly by a donation from the Worshipful Company of Goldsmiths, and these are used principally for the encouragement of research in inorganic and metallurgical chemistry, the remainder being income from the Perkin Memorial Fund and used for the investigation of problems related to the coal-tar and allied industries.

Patent Processes in Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patent Office, Southampton Buildings, London, W.C.2, at 1s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Production of monoazo and disazo pigments.—General Printing Ink Corporation. Dec. 22, 1942. 599,608.

Methods of cast polymerisation.—Pittsburgh Plate Glass Co. Jan. 11, 1943. 599,792.

Light-polarising material and manufacture thereof.—International Polaroid Corporation. May 7, 1943. 599,794.

Manufacture and utilisation of cold setting polyhydric phenolic aldehyde adhesives. —P. H. Rhodes. Oct. 6, 1942. 599,683.

Production of pyrazine derivatives.—Merck & Co., Inc. Sept. 18, 1943. 599,686.

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Production of pyrazine derivatives.—Merck & Co., Inc. Sept. 18, 1943. 599,689.

Production of pyrazine derivatives.—Merck & Co., Inc. Sept. 18, 1943. 599,690.

Working magnesium and its alloys.—Elastic Stop Nut Corporation of America. Sept. 24, 1943. 599,691.

Determination of the content of a mineral in ores or the like.—R. C. O. Wiig. Sept. 27, 1944. 599,613.

Manufacture of the metal derivatives of alkyl phenols and their sulphide, selenide, and telluride derivatives.—J. C. Arnold. (Standard Oil Development Co.) Oct. 25, 1944. 599,729.

Manufacture of co-polymers of aliphatic hydrocarbons.—J. C. Arnold. (Standard Oil Development Co.) Nov. 14, 1944. 599,803.

Manufacture of articles from rubber or the like.—Dewey & Almy Chemical Co. Nov. 16, 1943. 599,615.

Thermal evaporation of metals in a vacuum.—P. Alexander. Nov. 30, 1944. 599,694.

Ceramic compositions.—C. E. Every. (Titanium Alloy Manufacturing Co.) Dec. 11, 1944. 599,806.

Construction and use of melting pots for the aluminothermic and like exothermic extraction of metals from metal compounds. E. Lux. Jan. 3, 1945. 599,695.

Stabilisation of hydrocarbon materials. —J. C. Arnold. (Standard Oil Development Co.) Jan. 15, 1945. 599,733.

Reagents and concentration process for treating non-sulphide ores.—American Cyanamid Co. Feb. 4, 1944. 599,810.

Centrifugal compressors.—H. Pearson. Jan. 23, 1945. 599,735.

Fluxes for use in connection with the welding or jointing of aluminium and its alloys.—H. O. Ormiston. March 5, 1945. 599,699.

Light antifriction alloy.—Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges & Camargue. April 16, 1942. 599,621.

Method of preparation of melamine.—Produits Chimiques de Ricecourt. April 14, 1944. 599,702.

Preparation of 2-sulphanilamidopyrazine. —American Cyanamid Co. May 16, 1944. 599,738.

Method of manufacture of synthetic resin articles by polymerisation.—J. Doucerain. June 28, 1943. 599,555.

Azo dyestuffs.—General Aniline & Film Corporation. April 19, 1944. 599,623.

Polymerisation.—Firestone Tyre & Rubber Co. Sept. 8, 1944. 599,741.

Treatment of alkaline-earth metal salt minerals.—American Cyanamid Co. Aug. 23, 1944. 599,825.

Process for the catalytic reforming of naphthas.—C. Arnold. (Standard Oil Development Co.) May 29, 1945. 599,558.

Solvent extraction for the separation of electrolytes.—Shell Development Co. June 19, 1944. 599,827.

Process for dyeings after-treated with copper compounds.—Ciba, Ltd. June 14, 1944. 599,830.

Manufacture of purified penicillin.—Hoffmann-La Roche, Inc. June 27, 1944. 599,626.

Refining and concentration of manganese, silica and chromite ores.—S. Chatterjee. Aug. 18, 1944. 599,833.

Manufacture of azo dyestuffs.—Soc. Anon. de Matieres Colorantes et Produits Chimiques Francolor. April 8, 1943. 599,834

Printing inks containing phenolformaldehyde condensates.—H. G. C. Fairweather. (F. H. Levy Co., Inc.) July 21, 1945. 599,835.

Preparation of polymerisable organic materials, and polymers, and co-polymers thereof.—I.C.I., Ltd., and F. J. H. Mackereth. Aug. 1, 1945. 599,837.

Polymethin dyes and photographic materials containing them.—Kodak, Ltd. (Eastman Kodak Co., and G. H. Keyes.) July 12, 1944. 599,636.

Production of dyestuffs and processes of colouration.—H. C. Olpin, and K. R. House. Aug. 21, 1945. 599,840.

Home News Items

Price Change.—Glaxo Laboratories, Ltd., Greenford, announces that with affect from April 19, the following new prices will apply for Acramine Yellow: 5 gm. 5s.; 25 gm. 22s. 6d. Trade discount will be 33⅓ per cent.

Strike Notices Withdrawn.—Cokemen at the Derwenthaugh Coke Works near Newcastle-on-Tyne have withdrawn strike notices which were due to expire on April 17, and which would have affected gas supplies to the Newcastle and Gateshead Gas Co., Ltd. The men are claiming double time for Sunday work, and time-and-a-third for ordinary overtime. Negotiations have been re-opened with the National Coal Board.

Aluminium Merchant Ships.—Plans for the production of Britain's first all-aluminium merchant ships are rapidly taking shape in shipbuilding research establishments. It is probable that the first vessel to be constructed will be about 2000 tons and designers claim that use of the new aluminium alloys would mean increased cargo capacity, or reduction of the ship's size with the same capacity, in addition to greater speed.

Rutherglen Exhibition.—Industries in Rutherglen, including the chemical and pharmaceutical industries, are to join in an experiment sponsored by the Rotary Club, aimed at attracting local labour to local industries. It will take the form of a Town and Trade Exhibition from May 29 to June 12. One of the objects is to demonstrate to local youth the type of goods or services created locally and to explain the prospects offered by employment in the industry.

Industrial Exhibition at Poole.—An organising committee of local trades union men and industrialists, with the Mayor as chairman, is arranging a "Poole Industrial Products Exhibition" to be held in Poole (Dorset) from June 19 to June 25. Exhibitors are limited to local manufacturers and will include Decca Record and British Drug Houses. The East Dorset district is famous for its ball clay and several of the potteries will be exhibiting.

Newport Works Acquired. — Imperial Works of D. G. Hall and Co., Ltd., Coverack Road, Newport (Mon.), has been purchased as a going concern by Thos. W. Ward, Ltd., Albion Works, Sheffield. Situated on the bank of the River Usk, the works occupy a site of approximately four acres and have been operated for some years on the building and repair of railway wagons. Thos. W. Ward intends to develop to the full the scope of the various workshops, at first primarily for repairing.

Mersey Memorial Service.—Mr. J. Highfield Jones, chairman of the Mersey Iron Works, Ellesmere Port, on April 11 unveiled a tablet in the works institute commemorating employees who fell in the war. A service was conducted by the vicar, the Rev. E. M. E. Southwell. Brigadier W. O. Bowen, C.B., C.B.E., Western Command, inspected a guard of honour of employees.

Herring Oil Factory.—The herring oil factory which the Herring Industry Board is to erect and equip on a site near Wick Harbour will make Wick a centre for surplus herring, especially from the West Coast grounds. That was the opinion expressed by members of Wick Harbour Trust who recently decided to give the Board the necessary facilities for its project.

Scottish "Heatherwood" Project.—The "Heatherwood" project sponsored by the Scottish Co-operative Wholesale Society, Ltd., has not yet reached the stage of actual commercial production and is still undergoing experimental development. The process is based on the patents of Mr. Ubaghs whereby heather roots are compressed under heavy pressure, with appropriate resins, to form a synthetic wood, suitable for veneering, flooring and other purposes.

Improving Prospects for Shale Oil.—Output in the shale oil industry has received a marked stimulus from the advent of 200 European workers, according to the report of the National Union of Shaleminers and Oilworkers. It is also stated that there has been a surprising and welcome reduction in absenteeism since the introduction of new wage rates and conditions in May 1947. Of equal importance is the fact that the drift from the industry has been arrested.

Plant Maintenance Allowance

SPEAKING at the annual meeting of the Dundee Chamber of Commerce last week, Colonel Lionel E. Hill, the president, suggested that, if British industry were to survive, a percentage should be allowed annually free of tax on the replacement value of all plant and that it should be obligatory on managements to set aside a sum every year for replacements chargeable as part of the cost of production and of the selling price. In industries whose selling prices were subject to Government control this obsolescence allowance should be incorporated in the cost structure.

Next Week's Events

SATURDAY, APRIL 24

Royal Institute of Chemistry (London and S.E. Counties Section). Brighton Technical College, Brighton, 5.45 p.m. W. A. Damon: " A Day in the Life of an Alkali Inspector." (Newcastle-upon-Tyne and Tees-side Sections and Society of Chemical Industry). Norton Hall, Norton, Stockton-on-Tees, 3.15 p.m. L. C. Pauling: " The Structure of Antibodies and the Nature of Serological Reactions."

MONDAY, APRIL 26

Chemical Society (Birmingham Section). Chemical Lecture Theatre, King's College, Newcastle-upon-Tyne, 4.30 p.m. M. G. Evans: " Electron Transfer Reactions."

Institution of the Rubber Industry (Midland Section). James Watt Memorial Institute, Great Charles Street, Birmingham, 3, 7.15 p.m. Annual general meeting.

Leeds University Union Society of Chemical Engineering. Chemistry Department Lecture Theatre " A," University of Leeds, 5.0 p.m. C. S. Windebank: "Progress in Petroleum Research."

TUESDAY, APRIL 27

Society of Instrument Technology. Royal Society of Tropical Medicine and Hygiene, Manson House, Portland Place, W.1, 6.30 p.m. A. J. Young: " Some Impressions of Modern American Instrumentation."

TUESDAY, APRIL 27 to FRIDAY, APRIL 30

Institute of Welding. Manchester. Spring meeting. Wednesday: E. Fuchs and D. A. Godfrey: " Some Aspects of Welding in the Heavy Chemical Industry." Thursday. J. R. Ferguson: " Welding in Production."

WEDNESDAY, APRIL 28

Society of Chemical Industry (Newcastle-upon-Tyne Section). Chemistry Lecture Theatre, King's College, Newcastle-upon-Tyne, 6.0 p.m. Annual general meeting, 6.30 p.m. M. Stacey: "Immune Chemistry." (Food Group). Rooms of the Chemical Society, Burlington House, Piccadilly, W.1, 6.30 p.m. Dr. E. B. Hughes: " The Chemistry of Coffee."

Northampton Polytechnic St. John Street, E.C.1, 7.0 p.m. P. A. Claret: " Newer Engineering Materials—Silicones."

WEDNESDAY, APRIL 28, to FRIDAY, APRIL 30

Zinc Alloy Die Casters Association. Room 174, Midland Hotel, Birmingham, 10.0 a.m.-6.0 p.m. Exhibition of zinc alloy pressure die castings.

THURSDAY, APRIL 29

Royal Institute of Chemistry (Manchester Section). Engineers' Club, Albert Square, Manchester, 7.0 p.m. Annual General Meeting. J. R. Whinfield: " Terylene."

The Royal Society. Burlington House, Piccadilly, W.1, 4.30 p.m. J. Gladsby, F. J. Long, P. Sleightholm and K. W. Sykes: " The Mechanism of the Carbondioxide-carbon Reaction ": F. J. Long and K. W. Sykes: " The Mechanism of the Steam Carbon Reaction "; J. Gladsby and K. W. Sykes: " The Control of the Temperature of Endothermic Reactions in Flow Systems."

FRIDAY, APRIL 30

Oil and Colour Chemists' Association (Manchester Section). 2.15 p.m. A visit to the paint and varnish factory and Laboratories of the Metropolitan-Vickers Electrical Company, Ltd., Trafford Park, Manchester.

SATURDAY, MAY 1

Royal Institute of Chemistry (London and S.E. Counties Section). Oak Restaurant, 18 Kensington High Street, W.8, 7.0 p.m. Dance.

Society of Chemical Industry (Southwest Section). Meet at Newton Abbot, 12.30 p.m. Afternoon tour of Seale Hayne College. A. W. Marsden: " The Chemist in Agriculture."

SUMMER SCHOOL IN METAL PHYSICS

By the courtesy of Prof Sir Lawrence Bragg a summer school in metal physics will be held this year in the Cavendish Laboratory. The school will provide an introduction to the application of physical methods to the examination and utilisation of metals, and is intended for those whose researches require a more fundamentally physical approach than is usual in ordinary metallurgical and engineering practice. The lectures and demonstrations will deal with the application of X-ray methods in the examination of metals and physical and mechanical properties of metals. Both studies will be taken by all attending the school, and in dealing with the examination of metals an elementary knowledge of X-ray diffraction methods and of crystal symmetry will be assumed as during the school it will be possible to provide only a very brief review of these aspects of the subject-matter. The school will be held from Monday, August 23, to Friday, September 3, inclusive. A detailed syllabus and form of application for admission may be obtained from G. F. Hickson, M.A., secretary of the Board of Extra-Mural Studies, Stuart House, Cambridge, to whom the completed application form should be returned not later than June 1.

Overseas News Items

Copper in the Russian Zone.—Extensive copper deposits are reported to have been discovered recently at Sangershausen, Saxony, in the Russian zone of Germany.

Increase in U.S. Fertiliser Exports.—According to the National Fertiliser Association of America, exports of U.S. fertiliser and fertiliser materials amounted last year to 1,561,000 short tons, an increase of just under 300,000 tons upon the 1946 figure.

Aluminium Production in N.E. Indies.—A plant is to be opened at Palembang for the manufacture of aluminium oxide from bauxite mined on Bintan island by the Netherlands East Indies Company for the Exploitation of Bauxite. Reserves in the area are estimated at 10 million tons.

U.S. Technical Developments.—Among latest technical developments to be announced in the U.S.A. are: plastic electro-magnets containing no metals, and said to have a life comparable with that of conventional steel magnets, but produced at one-tenth the cost; and a new odourless pickling liquor possessing an inhibiting action in both HCl and H_2SO_4,—it is said to dissolve cleanly, leaving no sludge, slime or precipitates.

Record Oil Output in Mexico.—All previous Mexican oil production figures were eclipsed by last year's record output of 7.9 million tons, an increase of 14 per cent on the 1946 total. The Poza Rica field, with a contribution of 31.5 million barrels, was the major production centre. Exports of crude oil more than doubled in quantity last year and imports of refined products also showed an increase of over one million barrels.

New Spanish Companies.—It is reported from Barcelona that three new firms plan to enter the chemical and metallurgical industries. They are Julio Ribero Meneses, aiming to produce 200,000 items of thermoplastics per year for telephone installations, Concentration de Industrias Metalurgicas, S.A., with a production target of metal goods valued at 2.5 million pesetas a year, and Laboratories Taya y Bofill, producing pharmaceutical specialities.

Brown Coal as Boiler Fuel.—Extensive experimental work on the use of brown coal as a fuel for factory boilers has been carried out in Victoria, Australia, where in recent years there has been a relative shortage of black coal for this purpose. It has been shown that despite its high moisture content of over 50 per cent, brown coal can be satisfactorily burnt in steam boilers if suitable modifications are made to the stokers.

Germany to Produce Synthetic Fats Again.—Production of synthetic fats is to be resumed at a relatively early date in the Bergkamen chemical plant in the Ruhr.

Synthetic Glycerine Production Delayed.—Because of difficulties in supplying the necessary equipment, etc., U.S. plans to take up the manufacture of synthetic glycerine have been delayed until the end of this year.

Austrian Aluminium Plant's Revival.—The United Aluminium Works Ltd., Braunau, Austria, one of the most up-to-date units in Europe, with an annual capacity of some 60,000 tons of aluminium metal, is reported to have resumed operations last month.

Du Pont Agricultural Section.—Creation of an Agricultural Product Development Section has been announced by the Du Pont Company. The new section will be managed by Mr. Bertel C. Nylen, an experienced chemist, and will form part of the Grasselli Chemicals Department, which manufactures a wide variety of chemical products, including plant hormones and compounds for controlling insects, fungi, weeds, and rats.

Italy's Neglected Mercury.—During recent months the output of mercury in Italy has declined considerably. Overseas markets afford little opportunity for the export trade and home consumption is small as the peacetime use of mercury is limited This fall in production exists despite the fact that the reserves of mercury at Monte Amiata are much greater than those of the U.S.A. The cost of Italian mercury is less than that of American or Spanish.

Canadian Chlorine Plant.—Dominion Tar and Chemical Co., Ltd., Canada, has decided to proceed with the construction of a $4.5 million chlorine and caustic soda plant, which is expected to be in production by January, 1949. To provide part of the funds 150,000 preferred shares of $23.50 par value were sold last year, bringing the preferred issue to 300,000 shares. Additional funds still required will be provided out of earnings.

Swedish Match Industry Confiscation.—The Swedish Government in a recent protest against the confiscation of the Swedish match industry in Rumania stated that action of that kind could not be overlooked, and that the Swedish Government would energetically support the Swedish Match Company's claim for compensation. Several talks on the subject have taken place in Bucharest between the Swedish Minister to Bucharest and Rumanian cabinet ministers.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

GEORGE FOWELL LTD., Smethwick, sheet metal workers. (M., 24/4/48.) March 10, £2500 debenture, to Branch Nominees Ltd.; general charge. *£2000. April 28, 1945.

BERANANG (SELANGOR) RUBBER PLANTATIONS LTD., London, W. (M., 24/4/48.) March 19, charge, to Industrial Rehabilitation Finance Board, Malaya, securing all sums which the charges may be called upon to pay under or by reason of a certain guarantee; charged on Beranang Rubber Estates, Malaya. *Nil. June 26, 1947.

RAHMAN RUBBER ESTATE LTD., London, E.C. (M., 24/4/48.) March 16, two charges, to Industrial Rehabilitation Finance Board each securing all sums which the charge may be called upon to pay under a certain guarantee; both charged on certain lands in District of Ulu Langat (Selangor) forming parts of land known as Rahman & Sungei Sering Estates. *Nil. July 29, 1947.

Company News

The name of **British Sako Products, Ltd.,** manufacturers of and dealers in chemical products, etc., 66 Fenchurch Street, London, E.C.3, has been changed to **Warham Ltd.** as from March 22, 1948.

The Texas Oil Co., Ltd., amalgamated its interests in the United Kingdom with those of the U.K. Marketing Organisation of Trinidad Leaseholds, Ltd., on April 1, and the combined undertakings will operate as **The Regent Oil Co., Ltd.** The share capital of the latter company is held equally between the California Texas Corporation and Trinidad Leaseholds, Ltd., the parent companies of the two merging U.K. interests. The head office of Regent Oil Company, Ltd., will be situated at: 117 Park Street, Oxford Street, London, W.1.

New Companies Registered

R. A. Over, Ltd. (451,485).—Private company. Capital £12,000. Consulting analytical, manufacturing, pharmaceutical and general chemists, etc. Directors: R. A. Over and J. W. H. Perrin. Reg. office: 664 Oxford Road, Reading.

Duraplex Industries, Ltd. (451,878).—Private company. Capital £40,000. Manufacturers of plastics and plastic materials and articles made therefrom, chemicals, textiles and fabrics, etc. Reg. office: Clifford's Inn, Fleet Street, E.C.4.

G. B. W. Chemicals, Ltd. (452,167).—Private company. Capital: £10,000. Manufacturers and merchants of plastic and chemical compounds, manufacturing chemists, etc. Reg. office: Burwood House, 14 Caxton Street, S.W.1.

Gibbs Manufacturing Co., Ltd. (452,011).—Private company. Capital £5000. Manufacturers of chemicals, gases, drugs, medicines, etc. Directors: J. R. Gibbs and Joan Cornelius. Reg. office: 12a Dartmouth Road, Paignton.

Talke Chemical Co., Ltd. (451,846).—Private company. Capital: £5000. To acquire the business of chemical manufacturers carried on by S. Stonier and C. Stonier, as The Talke Chemical Co., at Talke, Staffs. Directors: S. Stonier and C. Stonier. Reg. office: Talke, Staffs.

D. D. B. Proprietories, Ltd. (452,469).—Private company. Capital £1000 in £1 shares. Wholesale, manufacturing, pharmaceutical, and dispensing chemists, etc. Directors: R. Dodd, R. J. Dodd, and F. G. Bendix. Reg. office: 12 King Street, Blackburn.

Furmoto Chemical Co., Ltd. (451,570).—Private company. Capital £10,000. To acquire the business of a manufacturing chemist carried on by C. Thornfield as the Furmoto Chemical Company. Directors: C. Thornfield and A. Thornfield. Secretary: Joan E. Clark. Reg. office: 1-3 Brixton Road, S.W.9.

Acalor (1948), Ltd. (451,623).—Private company. Capital £1000. Chemical engineers, chemical manufacturers and constructors of specialised chemical installations, manufaturers of paints, polishes, colours, dyes, oils, etc. Subscriber: R. M. G. Esdaile. Secretary: R. Stringer. Reg. office: 66 Victoria Street, S.W.1.

John Wood (Steel Drums), Ltd. (451,752).—Private company. Capital: £20,000. Makers of steel drums, sheet metal workers, engineers, etc. Directors: J. Wood and Mrs. Ann Wood, and H. Halliday. Reg. office: Victoria Street Works, Oswaldtwistle, Accrington.

Traxator (Great Britain), Ltd. (452,358).—Private company. Capital £1000. Manufacturers of medical, electro-medical, chemical, photographic, surgical and scientific apparatus and equipment, etc. Directors: T. McC. Sweetman, and F. J. Wild. Reg. office: 3 Finch Lane, E.C.3.

Vicsons, Ltd. (452,141).—Private company. Capital £1500. Manufacturers and retail dealers in laboratory equipment and furnishings, glassware, scientific apparatus, etc. Directors: V. Wrate, Charlotte M. Wrate, A. J. Wrate, and J. V. Wrate. Reg. office: 148 Pinner Road, Harrow.

Jenolizing Co. of Canada, Ltd. (451,856).—Private company. Capital £20,000. Manufacturers, wholesalers and retailers of all kinds chemicals and chemical preparations, including rust preventive varnishes, lacquers, paints, enamels, etc. Directors: Air Vice Marshal D. F. Stevenson, C.B., C.B.E., D.S.O., M.C. (Retd.), and J. H. Lawrence. Reg. office: 19 Charing Cross Road, W.C.2.

American Coal Logs (England), Ltd. (451,915). — Private company. Capital £10,000. To acquire licences, patents and rights for processes relating to carbonisation of coal and extraction of liquid by-products therefrom and the production of smokeless fuel, char and industrial cokes, etc. Directors: S. Sebba and Gwynne Cellan-Jones. Secretary: S. Sebba. Reg. office: 7/8 Great Winchester Street, E.C.2.

Chemical and Allied Stocks and Shares

EARLIER in the week stock markets were cautiously awaiting the Italian election result, but subsequently business improved, industrial shares receiving more attention, while British Funds fully maintained their sharp rally in evidence at the end of last week.

Shares of chemical and kindred trades received rather more attention, the good yields bringing in buyers. Imperial Chemical, which remained under the influence of the results, were 48s. 6d. Fisons changed hands around 62s., British Aluminium at 50s. have been firm following the annual meeting, and talk of big developments, while General Refractories strengthened to 24s. United Molasses were firmer at 50s. 9d., Dunlop Rubber 73s., and firmness at 22s. 9d. was displayed by British Glues & Chemicals 4s. shares. In other directions, Albright & Wilson 5s. shares strengthened to 30s. 1½d. B. Laporte 5s. units were 21s. 3d., and Lawes Chemical 10s. shares changed hands around 13s. 9d Major & Co.'s shares were 2s. 9d. Elsewhere, Boake Roberts were 32s. 6d. Full results of Monsanto Chemicals strengthened the 5s. shares to 58s. 1½d. The company has distributed its annual reports and accounts to employees as well as shareholders—a practice which is expected to be followed by other companies.

Hopes that the London Metal Exchange may be re-opened before long helped Amalgamated Metal shares, which strengthened to 21s. 7½d. Elsewhere, Birmid Industries have improved to 85s., and there has been activity up to 87s. 6d. in British Benzol and Coal Distillation shares accompanied by market talk of a possible return of capital. Awaiting the results, which are expected to show a further increase in profits owing to expansion in export trade, Babcock & Wilcox shares were steady at 70s. 9d. Hadfields at 28s. 9d. responded to the full report, and iron and steel shares generally continued to attract a good deal of attention because of the good yields. Colvilles at 31s. 6d. were firm on the financial results. Dorman Long were 31s. 3d. Guest Keen 49s. 9d., and Tube Investments changed hands over £6⅝. Stewarts & Lloyds at 56s. 1½d. have been fairly steady, awaiting the dividend announcement. Thomas & Baldwins 6s. 8d. shares changed hands around 14s. 3d., United Steel firmed up to 30s., and T. W. Ward were 63s.

Textiles have been fairly steady with Coats 62s. 9d. pending the full results. It is realised that the dividend limitation stipulation precludes higher payments from textile companies, but on the other hand, in many cases yields on last year's payments are not unattractive. Moreover, if export targets are achieved there would be a big increase in earnings of many companies which would doubtless find some reflection in the market prices of their shares. Courtaulds were 40s. 6d., and British Celanese 22s. 3d.

British Plaster Board 5s. shares were 24s. 9d. and satisfaction with the financial results kept Associated Cement at 74s. Paint shares have been firm on further expansion in the Dominions. Lewis Berger changed hands up to £8⅞ following news of the company's plans for new factories in Australia.

Boots Drug at 53s. 6d. have been firmer, with Beechams deferred 21s. 6d., Sangers 5s. shares higher at 34s. 6d., and British Drug Houses 5s. shares 11s. 3d. Glaxo Laboratories were better at £17¾. Cooper McDougall & Robertson strengthened to 38s. 6d., the results drawing attention to the not unattractive yield on the basis of the unchanged 8 per cent dividend. Oils have been less active with Shell 76s. 3d., and Anglo-Iranian slightly below £8¼.

Prices of British Chemical Products

A FIRM tone continues to be displayed in all sections of London's chemicals market, and buying interest has been sustained both for home account and for shipment. Delivery specifications against existing commitments are being met with satisfactory promptness but the overall supply position remains short of the aggregate demand for home and export. There is considerable pressure for fertiliser deliveries and most of the soda products are in strong request, notably chlorate of soda and bichromate of soda. There has been no change in the position of the potash chemicals and in other sections business has remained steady, with nothing of outstanding interest to report. Activity in the coal-tar products market is again on a good scale with traders able to find an outlet for almost anything that comes on offer. A satisfactory feature of this market is the steady export demand for pitch, creosote oil, cresylic acid and road tar.

MANCHESTER.—Chemical traders on the Manchester market are handling a steady flow of delivery specifications from textile and other leading industrial consumers of both light and heavy materials and contracts are being drawn against satisfactorily. The past week has witnessed a fair volume of replacement buying in the alkali and other products by home users, and there has been no apparent easing so far of buying interest on overseas account. Little actual change in price falls to be reported. There is keen pressure for fertiliser supplies, especially superphosphates and potash-containing compounds. In the by-products market pretty well all descriptions are in brisk demand.

GLASGOW.—In the Scottish chemical market business has been very quiet during the week. There is a remarkable lack of interest in chemicals for experimental purposes at the present time, which is possibly indicative of a general unsettled feeling with regard to future conditions. There has been a marked shortage of barium chloride crystals which is due to a great extent of the closing down of the works of Messrs. Athole G. Allen (Stockton), Ltd., which supplied a considerable proportion of Scotland's requirements of this material. In the export market conditions have also been quiet and there are no developments worthy of recording.

Price Changes

Rises: Formaldehyde and lactic acid.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton, £64; 80% pure, 1 ton, £66; commercial glacial 1 ton £79; delivered buyers' premises in returnable barrels: £4 10s. per ton extra if packed and delivered in glass.

Acetic Anhydride.—Ton lots, d/d, 11¾d. per lb.

Acetone.—Maximum prices per ton, 1/5 tons, £76 10s.; single drums, £77 10s.; delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each. For delivery in non-returnable containers of 40/50 gallons, the maximum prices are £3 per ton higher. Deliveries of less than 10 gallons free from price control.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 7¾d. per proof gallon; 5000 gal. lots, d/d, 2s. 10¾d. per proof gal.

Alum.—Loose lump, £16 per ton, f.o.r. MANCHESTER: £16 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate. — MANCHESTER: £41 per ton d/d.

Ammonium Carbonate.—£42 per ton d/d in 5-cwt. casks. MANCHESTER: Powder, £43 d/d.

Ammonium Chloride. — Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £21 to £25 per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Antimony Oxide.—£162 10s. per ton.

Antimony Sulphide.—Golden, d/d, as to quantity, etc., 4s. to 5s. per lb.

Arsenic.—Per ton, £40 5s. to £41 5s. according to quality, ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £25 15s. per ton, bag packing, ex works.

Barium Chloride.—98/100% prime white crystals, 5-ton lots, £26 per ton, bag packing, ex works.

Barium Sulphate (Dry Blanc Fixe).—Precip. 4-ton lots, £26 10s. per ton d/d; 2-ton lots, £26 15s. per ton.

Bleaching Powder.—Spot, 35/37%, £11 to £11 10s. per ton in casks, special terms for contract.

Borax.—Per ton for ton lots, in free 1-cwt bags, carriage paid: Commercial, granulated, £30; crystals, £31; powdered £31 10s.; extra fine powder, £32 10s. B.P., crystals, £39; powdered, £39 10s.

extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £52; crystals, £53; powdered, £54; extra fine powder, £56. B.P., crystals, £61; powder, £62; extra fine, £64.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £5 15s. per ton, ex store.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£23 per ton, d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, $5\frac{5}{8}$d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less $2\frac{1}{2}$%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. $6\frac{3}{4}$d., other, 1s. 5.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 6s. 7d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 8d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 10d. per lb.

Copper Oxide. — Black, powdered, about 1s. $4\frac{1}{2}$d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 8d. per lb.

Copper Sulphate.—£42 10s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., from 201s. to 205s. per cwt. lots, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £115 per ton.

Formaldehyde.—£28 to £29 per ton in casks, according to quantity, d/d. MANCHESTER: £31 to £32.

Formic Acid.—85%, £55 per ton for ton lots, carriage paid.

Glycerine.—Chemically pure, double distilled 1260 s.g., 123/1 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d. to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. $0\frac{1}{2}$d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale tech., £75 per ton; dark tech., £65 per ton ex works; barrels returnable.

Lead Acetate.—White, 110s. to 115s. per cwt., according to quantity.

Lead Carbonate.—British dry, ton lots, d/d, £116 per ton.

Lead Nitrate.—About £115 per ton d/d in casks. MANCHESTER: £115.

Lead, Red.—Basic prices per ton: Genuine dry red lead, £106; orange lead, £118. Ground in oil: red, £132; orange, £144. Ready-mixed lead paint: red, £140; orange, £152 (subject to increase of £1 10s. per ton).

Lead, White.—Dry English, in 8-cwt. casks, £116 10s. per ton. Ground in oil, English, in 5-cwt. casks, £141 per ton.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d, £22 to £25 per ton.

Litharge.—£103 10s. to £106 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £18 5s.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £27 10s. per ton.

Magnesium Oxide.—Light, commercial, d/d, £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., for 2-cwt. lots, 7s. 6d.; smaller quantities dearer.

Mercurous Chloride.—8s. 10d. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £3[illegible] per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 4s. 10d. per gal.; pyridinised 64° O.P. 100 gal., 4s. 11d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£110 to £121 per ton packed in free 5-cwt. casks. MANCHESTER: £6 7s. per cwt.

Paraffin Wax.—Nominal.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. $1\frac{1}{2}$d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.
Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.
Potassium Chlorate.—Imported powder and crystals, nominal.
Potassium Chloride.—Industrial, 96 per cent 6-ton lots, £16.10 per ton.
Potassium Iodide.—B.P., 8s. 8d. to 12s. per lb., according to quantity.
Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.
Potassium Permanganate.—B.P., 1s. 8½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 8d. per lb.; technical, £7 14s. 3d. to £8 6s. 3d. per cwt., according to quantity d/d.
Potassium Prussiate.—Yellow, nominal.
Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £21 to £25 per ton, in casks, ex store.
Salicylic Acid.—Manchester: 1s. 10d. to 3s. 1d. per lb. d/d.
Soda Ash.—58° ex depôt or d/d, London station, £7 12s. 6d. to £8 7s. 6d. per ton.
Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.
Sodium Acetate.—£42 per ton, ex wharf.
Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.
Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7¼d. per lb., net, d/d U.K. in 7-8 cwt. casks.
Sodium Bisulphite. — Powder, 60/62%, £28 7s. 6d. per ton d/d in 2 ton lots for home trade.
Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.
Sodium Chlorate.—£45 to £47 per ton.
Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.
Sodium Fluoride.—D/d, £4 10s. per cwt.
Sodium Hyposulphite.—Pea crystals 22s. 6d. per cwt. (2-ton lots); commercial, 1-ton lots, £17 per ton carriage paid. Packing free.
Sodium Iodide.—B.P., for not less than 28 lb., 10s. 2d. per lb.
Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £103 ton.
Sodium Metasilicate.—£19 5s. per ton, d/d U.K. in ton lots.
Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £19 15s. per ton.
Sodium Nitrite.—£22 10s. per ton.
Sodium Percarbonate.—12½% available oxygen, £7 11s. 9d. per cwt. in 1-cwt. drums.
Sodium Phosphate.—Di-sodium, £32 10s. per ton d/d for ton lots. Tri-sodium £62 per ton d/d for ton lots (crystalline).
Sodium Prussiate.—9d. to 9½d. per lb. ex store.
Sodium Silicate.—£6 to £11 per ton.
Sodium Silicofluoride.—Ex store, nominal.
Sodium Sulphate (Glauber Salt).—£8 per ton d/d.
Sodium Sulphate (Salt Cake).—Unground. Spot £4 11s. per ton d/d station in bulk. Manchester: £4 15s. per ton d/d station.
Sodium Sulphide. — Solid, 60/62%, spot £23 per ton, d/d, in drums; broken £23 15s. per ton, d/d, in casks.
Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.
Sulphur.—Per ton for 4 tons or more ground, £14 12s. 6d. to £16 17s. 6d. according to fineness.
Sulphuric Acid.—168° Tw., £6 10s. 2d. to £7 10s. 2d. per ton; 140° Tw., arsenic free, £5 2s. 6d. per ton; 140° Tw. arsenious, £4 15s. per ton. Quotations naked at sellers' works.
Tartaric Acid.—Per cwt., for 10 cwt. or more, £15 8s.; 5 to 10 cwt., £15 9s. 6d.; 2 to 5 cwt., £15 11s.; 1 to 2 cwt. £15 13s. Less than 1 cwt., 3s. 1d. to 3s. 3d. per lb. d/d, according to quantity.
Tin Oxide.—1-cwt. lots d/d £25 10s.
Titanium Oxide.—Comm., ton lots, d/d, (5 lb. bags), £97 per ton.
Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £75 10s.; green seal, £74 10s.; red seal, £73.
Zinc Sulphate.—No quotation.

Rubber Chemicals

Antimony Sulphide.—Golden, 3s. to 4s. per lb. Crimson, 2s. 7½d. to 3s. per lb.
Arsenic Sulphide.—Yellow, 1s. 9d. per lb.
Barytes.—Best white bleached, £8 3s. 6d. per ton.
Cadmium Sulphide.—6s. to 6s. 6d. per lb.
Carbon Bisulphide.—£37 to £41 per ton according to quality, in free returnable drums.
Carbon Black.—6d. to 8d. per lb., according to packing.
Carbon Tetrachloride.—£50 10s. to £53 10s. per ton, according to quantity.
Chromium Oxide.—Green, 2s. per lb.
India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.
Lithopone.—30%, £33 12s. 6d. per ton.
Mineral Black.—£7 10s. to £10 per ton.
Mineral Rubber, "Rupron."—£20 per ton.
Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Phosphate.—Not quoted—temporarily unobtainable.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in January, £10 5s., rising by 1s. 6d. per ton per month to March, 1948.

Calcium Cyanamide.—Nominal; supplies very scanty.

Concentrated Fertilisers. — Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £14 18s. 6d.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean super-refined for 6-ton lots d/d nearest station, £17 5s. per ton; granulated, over 98%, £16 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8½d.; nitration grade, 2s. 10½d.

Carbolic Acid. — Crystals, 11½d. per lb. Crude, 60's, 3s. 6d. to 4s. MANCHESTER: Crystals, 9½d. to 11½d. per lb., d/d; crude, 4s. 3d., naked, at works

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 97%, 3s. 6d. per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 4s. 4d. per gal.

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p-**Cresol** 34/35° C.—Nominal.

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p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

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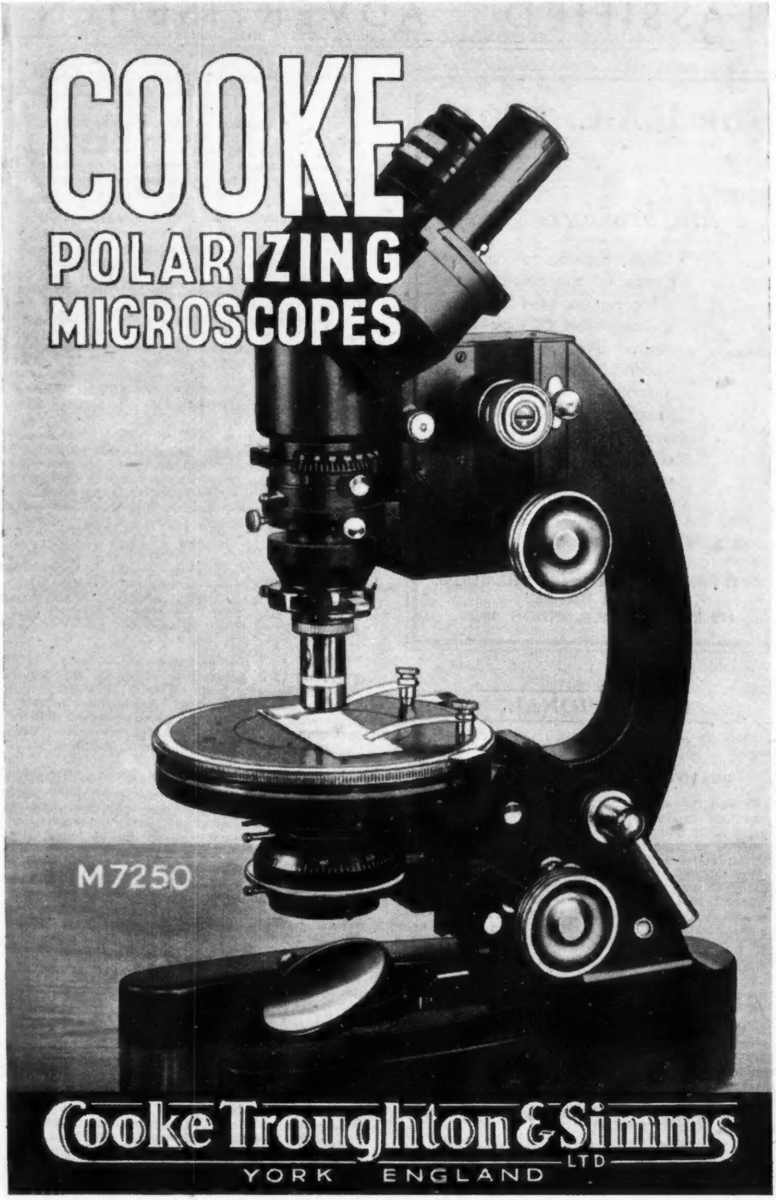
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